

Hanford Tank Farms Vadose Zone Monitoring Project

Quarterly Summary Report for First Quarter Fiscal Year 2005

February 2005



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Prepared for
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1.0 Introduction

The Hanford Tank Farms Vadose Zone Monitoring Project (VZMP) was established in fiscal year (FY) 2001 for comprehensive routine monitoring of existing boreholes in Hanford single-shell tank farms. The logging system used for monitoring is the Radionuclide Assessment System (RAS). A baseline record of existing contamination associated with gamma-emitting radionuclides in the vadose zone was established between 1995 and 2000 using the Spectral Gamma Logging System (SGLS). Although less precise, the RAS is a simpler, faster, and more cost-effective logging system than the SGLS. Measurements collected with the RAS can be compared to the baseline data to assess the long-term stability of the radionuclide contaminant profile. When routine monitoring identifies anomalies relative to the baseline, these anomalies may be investigated using the SGLS, the High Rate Logging System (HRLS), and/or the Neutron Moisture Logging System (NMLS). The HRLS is also used to collect data in boreholes where the contaminant activity exceeds the working range of the RAS instrumentation (greater than about 100,000 picocuries per gram [pCi/g] cesium-137 [^{137}Cs]).

During FY 2003, monitoring in boreholes associated with individual tanks undergoing retrieval operations was added to the work scope detailed in the original VZMP planning documents. Retrieval monitoring requirements for specific tanks are under development but include a pre-retrieval baseline measurement, monthly measurements during the retrieval operations, and monthly measurements for 6 months after retrieval operations cease. Both RAS and NMLS measurements are required for monthly monitoring, and monthly monitoring is supplemented by manual moisture measurements acquired by CH2M HILL Hanford Group, Inc. (CH2M HILL) personnel over limited depth intervals once or twice per week. During FY 2004, one new retrieval project (tank S-102) was initiated. Monitoring for two retrieval projects initiated in FY 2003 (tanks C-106 and S-112) continued into FY 2004. Resources (i.e., RAS) diverted from the routine monitoring to retrieval monitoring negatively impact the achievement of VZMP goals as originally set forth in 2001. Deployment of the NMLS to support retrieval operations requires an additional logging engineer and reassignment of the system from support for the RI/FS work conducted by the Department of Energy, Richland Operations Office (RL).

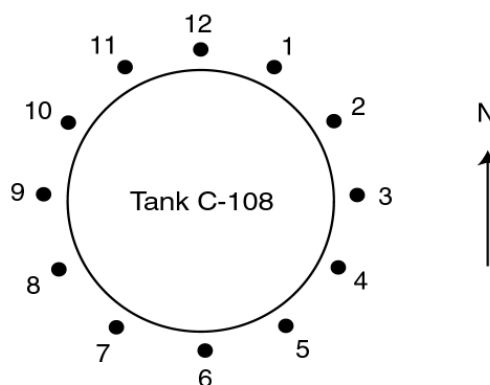
Routine quarterly reports are issued to summarize the results of monitoring activities, to provide the status of any ongoing special investigations, and to provide an updated listing of borehole intervals where monitoring is planned in the coming months. This quarterly report summarizes both routine and retrieval monitoring activities for the 1st quarter of FY 2005 and includes project-to-date results where appropriate. Retrieval monitoring is segregated from routine monitoring so that the impact to the latter can be considered.

For readers not familiar with the Hanford Tank Farms borehole-numbering scheme, the following illustration shows how to identify the location of a borehole from its identification number:

Tank Farm Numbering Scheme

A Farm	10
AX Farm	11
B Farm	20
BX Farm	21
BY Farm	22
C Farm	30
S Farm	40
SX Farm	41
T Farm	50
TX Farm	51
TY Farm	52
U Farm	60

Tank Farm Borehole Numbering Scheme



Boreholes are identified by numbers using the format FF-TT-PP, where "FF" = tank farm, "TT" = tank, and "PP" = the position around the tank in a time-clock numeral from 1 to 12 (12 = north). For example, borehole 30-08-02 is in the C Tank Farm, around tank C-108, and at approximately the 2 o'clock position.

2.0 Monitoring Results

Summaries of monitoring operations for the 1st quarter of FY 2005 and project-to-date are included in Table 2-1.

Table 2-1. Summary of Monitoring Operations for 1st Quarter of FY 2005

Month	October	November	December	FY05 Total	Project-to-Date Total
Routine Monitoring Events (RAS)	0	0	0	0	850
Retrieval Monitoring Events (RAS)	0	0	0	0	110
Total RAS Events	0	0	0	0	960
Total NMLS Events	2	5	9	16	104
Total RAS & NMLS Events	2	5	9	16	1064
Routine Main Log Footage (RAS)	0	0	0	0	47962
Routine Rerun Log Footage (RAS)	0	0	0	0	2278
Retrieval Main Log Footage (RAS)	0	0	0	0	11704
Retrieval Rerun Log Footage (RAS)	0	0	0	0	280

Retrieval Main Log (NMLS)	220	582	977	1779	11514
Retrieval Rerun Log (NMLS)	15	50	90	155	1035
Total RAS Footage	0	0	0	0	62224
Total NMLS Footage	235	632	1067	1934	12549
Total RAS & NMLS Footage	235	632	1067	1934	74773

Appendix A includes a table that provides further details of boreholes monitored during the 1st quarter of FY 2005. Table A-1 presents boreholes/events for NMLS retrieval logging. Normally, two additional tables summarizing the RAS routine and retrieval monitoring activities are included in this appendix. There was no RAS monitoring performed during the 1st quarter of FY 2005, so these tables were not produced for this report. These tables are derived from the project's monitoring database, which is continually updated as boreholes are monitored (DOE 2003). Boreholes are selected by a priority score (total score) that emphasizes proximity to tanks with significant drainable liquid remaining, and/or the presence of contaminant plumes, or where possible contaminant movement is suspected. The most significant change that occurs in the database is the monitoring frequency. Where monitoring results suggest possible contaminant movement, the monitoring frequency may be increased and depth intervals may be changed. Monitoring frequencies have also been changed to reflect the monthly monitoring requirement for retrieval operations in C and S Farms. Some lower priority boreholes are also selected for monitoring. This re-prioritization included boreholes in the vicinity of tanks being considered for closure in the near future, such as in C and S Farms.

The following sections describe the routine monitoring performed in each tank farm. In the interest of brevity, plots for boreholes where no apparent change was observed will not be included in this report. These logs are available on request. Table 2-2 lists boreholes that have shown indications of possible changes to the radionuclide contaminant profile. Appendix B contains a map of each single-shell tank farm with the locations of all boreholes used for monitoring. Each borehole location is identified by a label (borehole number) and a symbol. The symbols are used to represent the monitoring frequency of the borehole, and if any movement has been identified in a particular borehole. A black dot means the borehole has not been monitored since the SGLS baseline was performed. Boreholes that are not available for monitoring are also identified.

Table 2-2. Summary of Monitored Boreholes Indicating Radionuclide Contaminant Profile Changes

Tank Farm	Borehole Number	Radio-nuclide	Deter-mined	Number of Events	Assessment	Assigned Frequency	Qtrly/Annual Report
BX	21-12-02	⁶⁰ Co	09/23/03	3	Possible decrease	6 mos.	FY 2003
BX	21-27-08	²³⁸ U/ ²³⁵ U	03/13/02	5	Not confirmed	6 mos.	2 nd 2002
BY	22-03-04	⁶⁰ Co	11/15/01	4	Not confirmed	6 mos.	1 st 2002
BY	22-07-02	⁶⁰ Co	11/29/01	3	Not confirmed	6 mos.	1 st 2002
BY	22-07-05	⁶⁰ Co	12/12/01	3	Not confirmed	6 mos.	1 st 2002
BY	22-08-05	⁶⁰ Co	03/30/99	4	Not confirmed	6 mos.	1 st 2002
C	30-06-10	⁶⁰ Co	03/03/97	8	Definite change	1 mos.	FY 2004
C	30-08-02	⁶⁰ Co	09/11/02	8	Definite increase	1 mos.	FY 2004
C	30-08-03	?	01/21/03	3	Not confirmed	3 mos.	FY 2003
S	40-02-03	¹³⁷ Cs	07/09/03	1	Definite increase	1 mos.	FY 2004
SX	41-02-02	¹³⁷ Cs/ ⁹⁰ Sr	09/07/01	5	Not confirmed	6 mos.	FY 2001
SX	41-10-01	¹³⁷ Cs	02/11/03	4	Possible increase	6 mos.	FY 2003
SX	41-15-07	¹³⁷ Cs	02/12/03	2	Not confirmed	6 mos.	FY 2003
T	50-01-09	⁶⁰ Co	07/30/01	5	Not confirmed	6 mos.	FY 2001
T	50-02-05	¹³⁷ Cs	05/19/03	4	Not confirmed	6 mos.	FY 2003
T	50-06-02	⁶⁰ Co/ ¹⁵⁴ Eu	07/18/01	5	Not confirmed	6 mos.	FY 2001
T	50-06-03	⁶⁰ Co	07/18/01	5	Not confirmed	6 mos.	FY 2001
T	50-06-18	⁶⁰ Co	09/03/02	5	Possible increase	3 mos.	FY 2002
T	50-04-10	⁶⁰ Co	01/28/02	5	Possible confirmation	3 mos.	2 nd 2002
T	50-09-01	⁶⁰ Co/ ¹⁵⁴ Eu	07/23/01	5	Not confirmed	6 mos.	FY 2001
T	50-09-02	⁶⁰ Co	01/08/02	3	Not confirmed	12 mos.	2 nd 2002
T	50-09-10	⁶⁰ Co/ ¹⁵⁴ Eu	07/23/01	5	Not confirmed	6 mos.	FY 2001
TX	51-03-11	⁶⁰ Co	05/20/02	2	Possible increase	6 mos.	3 rd 2002
TY	52-03-06	¹³⁷ Cs	05/02/02	5	Definite change	3 mos.	3 rd 2002
TY	52-06-05	⁶⁰ Co	05/14/02	3	Possible increase	3 mos.	3 rd 2002
TY	52-06-07	⁶⁰ Co	05/22/03	2	Not confirmed	12 mos.	FY 2003
U	60-04-08	²³⁸ U/ ²³⁵ U	07/16/01	8	Not confirmed	6 mos.	FY 2001
U	60-05-05	²³⁸ U/ ²³⁵ U	08/27/02	5	Possible increase	6 mos.	FY 2002
U	60-07-01	²³⁸ U/ ²³⁵ U	07/12/01	8	Not confirmed	6 mos.	FY 2001

2.1 A Tank Farm

Routine monitoring was not performed in A Tank Farm during the 1st quarter of FY 2005. To date, 31 of 52 (60%) boreholes in A Farm have been monitored at least once since the baseline was complete. The date of the last routine monitoring event in A Farm was 6/12/03.

2.2 AX Tank Farm

Routine monitoring was not performed in AX Tank Farm during the 1st quarter of FY 2005. To date, 12 of 31 (39%) boreholes in AX Farm have been monitored at least once since the baseline was complete. The date of the last routine monitoring event in AX Farm was 6/11/03.

An LOW scan in tank AX-103 recorded a liquid level drop of 2.7 inches on 12/12/04. This decrease in liquid level was confirmed with an additional scan on 12/16/04. A "Problem Evaluation Request" (PER), PER-2004-6221, was initiated on 12/20/04 by CHG to address the issue. At the end of December 2004, a tank leak assessment was initiated; Stoller was asked to

provide existing RAS data from AX-103 and plan to monitor all the drywells surrounding tank AX-103. The seven boreholes surrounding tank AX-103 (11-01-09, 11-03-02, 11-03-05, 11-03-07, 11-03-09, 11-03-10, and 11-03-12) will be monitored as soon as CHG can provide the resources to operate the RAS. As of 12/31/04, none of the above boreholes had been monitored because of a lack of operator support. Borehole 11-03-02 was monitored on 1/17/05, but a lack of operator support has delayed the remaining boreholes indefinitely. Preliminary evaluation of data from borehole 11-03-02 indicates no detectable change relative to previous data collected on 6/13/02 and 6/11/03.

2.3 B Tank Farm

Routine monitoring was not performed in B Tank Farm during the 1st quarter of FY 2005. To date, 22 of 53 (42%) boreholes in B Farm have been monitored at least once since the baseline was complete. The date of the last routine monitoring event in B Farm was 4/21/03.

2.4 BX Tank Farm

Routine monitoring was not performed in BX Tank Farm during the 1st quarter of FY 2005. To date, 50 of 74 (68%) boreholes in BX Farm have been monitored at least once since the baseline was complete. The date of the last routine monitoring event in BX Farm was 10/6/03.

2.5 BY Tank Farm

Routine monitoring was not performed in BY Tank Farm during the 1st quarter of FY 2005. To date, 52 of 70 (74%) boreholes in BY Farm have been monitored at least once since the baseline was complete. The date of the last routine monitoring event in BY Farm was 11/12/03.

2.6 C Tank Farm

Routine monitoring was not performed in C Tank Farm during the 1st quarter of FY 2005. To date, 57 of 67 (85%) boreholes in C Farm have been monitoring at least once since the baseline was complete. The date of the last routine monitoring event in C Farm was 2/20/04.

Boreholes associated with the C-106 Waste Retrieval Project were not monitored with the RAS during the 1st quarter of FY 2005. The post-retrieval RAS monitoring event will be performed as soon as CHG can provide the resources to operate the system. The post-retrieval round of moisture logging was performed on the boreholes associated with the C-106 Retrieval Project. This work is discussed in detail in Section 3.1, "Tank C-106 Retrieval Monitoring."

2.7 S Tank Farm

Routine monitoring was not performed in S Tank Farm during the 1st quarter of FY 2005. To date, 44 of 72 (61%) boreholes in S Farm have been monitored at least once since the baseline was complete. The date of the last routine monitoring event in S Farm was 10/8/03.

Boreholes associated with the S-112 Waste Retrieval Project were not monitored with the RAS during the 1st quarter of FY 2005. These boreholes were logged once with the NMLS during the 1st quarter of FY 2005. This work is discussed in detail in Section 3.2, “Tank S-112 Retrieval Monitoring.”

Boreholes associated with the S-102 Waste Retrieval Project were not monitored with the RAS during the 1st quarter of FY 2005. The second round of moisture logging for these boreholes was initiated at the end of the 1st quarter of FY 2005. This work is discussed in detail in Section 3.3, “Tank S-102 Retrieval Monitoring.”

2.8 SX Tank Farm

Routine monitoring was not performed in SX Tank Farm during the 1st quarter of FY 2005. To date, 69 of 100 (69%) boreholes in SX Farm have been monitored at least once since the baseline was complete. The date of the last routine monitoring event in SX Farm was 8/12/03.

2.9 T Tank Farm

Routine monitoring was not performed in T Tank Farm during the 1st quarter of FY 2005. To date, 40 of 69 (58%) boreholes in T Farm have been monitored at least once since the baseline was complete. The date of the last routine monitoring event in T Farm was 6/18/03.

2.10 TX Tank Farm

Routine monitoring was not performed in TX Tank Farm during the 1st quarter of FY 2005. To date, 29 of 94 (31%) boreholes in TX Farm have been monitored at least once since the baseline was complete. The date of the last routine monitoring event in TX Farm was 6/4/03.

2.11 TY Tank Farm

Routine monitoring was not performed in TY Tank Farm during the 1st quarter of FY 2005. To date, 13 of 22 (59%) boreholes in TY Farm have been monitored at least once since the baseline was complete. The date of the last routine monitoring event in TY Farm was 5/29/03.

2.12 U Tank Farm

Routine monitoring was not performed in U Tank Farm during the 1st quarter of FY 2005. To date, 34 of 59 (58%) boreholes in U Farm have been monitored at least once since the baseline was complete. The date of the last routine monitoring event in U Farm was 8/20/03.

3.0 Retrieval Monitoring

3.1 Tank C-106 Retrieval Monitoring

The *Process Control Plan for Tank 241-C-106 Acid Dissolution* (Reynolds 2003) specified retrieval monitoring was to be conducted monthly: *“The wells will be monitored monthly (or before initial acid addition, monthly during retrieval, and after retrieval) to detect any changes in the radiation or moisture profiles of the soil.”* Additional manual measurements are to be performed by operations personnel within specific zones at a frequency of two times per week.

RAS retrieval monitoring started in January 2003, and seven monitoring events were conducted by the end of FY 2004. Beginning in April 2003, seven NMLS logs were acquired through the end of the 1st quarter of FY 2005. SGLS logging was performed in boreholes 30-06-02, -04, -09, -10, and 30-08-02 during late February and early March 2004 to investigate regions of apparent moisture increases. This logging was performed as a result of the PER initiated on December 3, 2003, in response to the apparent increase in moisture (~1%) in the vadose zone beneath tank C-106. The only increases in gamma activity identified during this logging occurred in boreholes 30-08-02 and 30-06-10. This zone of contaminant movement had been identified before the start of retrieval activities and therefore is not necessarily related to the retrieval process. Appendix C includes a summary plot of data acquired around tank C-106. These data include SGLS baseline measurements (⁴⁰K, ¹³⁷Cs, ⁶⁰Co), seven moisture measurements, and the RAS measurements acquired through the end of the 1st quarter of FY 2005.

The final post-retrieval moisture logging event was conducted during the 1st quarter of FY 2005. No significant moisture changes were observed during the final logging event. The post-retrieval RAS monitoring will be conducted as soon as CHG can provide resources to operate the system. Stoller will issue a final C-106 Retrieval monitoring report after the post-retrieval round of RAS monitoring has been completed. As of January 31, 2005, this work is delayed indefinitely pending available operator support.

3.2 Tank S-112 Retrieval Monitoring

The *Process Control Plan for Saltcake Dissolution Retrieval Demonstration in Tank 241-S-112* (Barton 2003) specified retrieval monitoring requirements. *“A baseline profile will be taken prior to retrieval operations, and subsequent monitoring results will be compared with that baseline profile. Moisture monitoring using the truck-mounted system will be done before beginning, at the end, and whenever there is a shutdown of retrieval operations greater than 4 weeks. An initial baseline will be established by deploying calibrated gamma and neutron moisture probes over the full depth of each drywell. During waste retrieval operations, the truck-mounted systems will be supplemented by the use of manually deployed moisture gages at least once a week while actively retrieving the waste at depths corresponding to moist layers at or below the floor of the tank.”*

The baseline moisture measurements were acquired during August 2003. Three additional moisture logging events (October, November, and February) were performed in the eight boreholes surrounding tank S-112. A fourth moisture logging event was performed in boreholes 40-11-08 and 40-12-04 in April 2004. This logging event was cut short by the fresh-air entry requirement and was not completed. Moisture logging resumed during the 1st quarter of FY 2005 and all the S-112 boreholes were logged once during this quarter with the NMLS. There were minor increases identified during the latest moisture logging events, but these may be attributed to seasonal fluctuations. Additional moisture logging events will help assess the effects of seasonal moisture variations. The latest RAS measurements were acquired during February 2004. Additional RAS measurements will be made as soon as CHG provides resources to operate the RAS. No changes in activity were observed between the two RAS measurements or since the baseline spectral gamma data acquired in 1996. As of January 31, 2005, this work is delayed indefinitely pending available operator support.

Log plots showing the Baseline SGLS data, RAS data, and moisture data for each borehole are included in Appendix D.

3.3 Tank S-102 Retrieval Monitoring

In anticipation of future tank S-102 (S Farm) retrieval activities, RAS monitoring of the boreholes around tank S-102 began in September 2002. An additional RAS monitoring event was performed in July 2003. The RAS collected monitoring data from five of the nine boreholes in April 2004. The other four boreholes were not monitored because work was halted due to the fresh-air entry requirement imposed on approximately April 16, 2004. An increase in ¹³⁷Cs concentration was discovered in borehole 40-02-03 between 44 and 47 feet during the first RAS monitoring event in July 2003. This increase was first reported in the *Annual Monitoring Report for Fiscal Year 2003* (DOE 2004).

Baseline moisture logging was performed in eight of the nine boreholes surrounding this tank. Moisture logging was not performed in borehole 40-02-04 because surface equipment prevented access to this borehole. SGLS logging was performed over selected intervals from three of these boreholes (40-02-03, 40-02-07, and 40-02-08). The SGLS logging confirmed the ¹³⁷Cs increase in borehole 40-02-03. High-rate logging was also performed in borehole 40-02-03. Log plots of the data collected above were provided to CHG via e-mail on April 12, 2004. These log plots are included in Appendix E.

No RAS monitoring was performed during the 1st quarter of FY 2005. RAS monitoring for the S-102 Retrieval Project will resume as soon as CHG provides resources to operate the system. As of January 31, 2005, this work is delayed indefinitely pending available operator support.

The second round of moisture logging was initiated for the S-102 Retrieval Project during the 1st quarter of FY 2005. Only borehole 40-03-03 was logged during this quarter. Moisture logs will be collected in the remaining boreholes during January 2005.

3.4 Tank C-103 Retrieval Monitoring

The waste retrieval for tank C-103 is scheduled to begin in early 2005. Baseline moisture logging and pre-retrieval RAS monitoring have yet to be performed in the boreholes surrounding this tank. The boreholes selected for C-103 Retrieval monitoring include: 30-03-01, 30-03-03, 30-03-05, 30-03-07, 30-03-09, and 30-06-04. These activities will commence as resources and construction activities around tank C-103 allow.

4.0 Special Projects

4.1 Tank AX-103 Leak Assessment

An LOW scan in tank AX-103 recorded a liquid level drop of 2.7 inches on 12/12/04. The decrease in liquid level was confirmed with an additional scan on 12/16/04. PER-2004-6221, was initiated on 12/20/04 by CHG to address the issue. At the end of December 2004, a tank leak assessment was initiated; Stoller was asked to provide existing RAS data from AX-103 and plan to monitor all the drywells surrounding tank AX-103. The seven boreholes surrounding tank AX-103 (11-01-09, 11-03-02, 11-03-05, 11-03-07, 11-03-09, 11-03-10, and 11-03-12) will be monitored as soon as CHG provides the resources to operate the RAS.

5.0 Operational Issues

No boreholes were monitored with the RAS during the 1st quarter of FY 2005. The project goal was to achieve an average of three boreholes per day with the RAS.

The project did not receive operator support to run the RAS during the 1st quarter of FY 2005. The RAS project has often had lower priority than other tank farm projects when manpower resources are assigned each day; therefore, when resources are required for higher priority tasks, the RAS operators are diverted to these other tasks.

Tables 5-1 and 5-2 include summaries of production and operational issues, respectively, that affect monitoring production.

Table 5-1. Summary of Monitoring Production (Project-to-Date)

Quarter	Total Work Days	Total Days Down	Total Monitoring Events	Boreholes Monitored per Day
4 th of FY01	56	29.3	84	1.5
1 st of FY02	56	35.2	54	1.0
2 nd of FY02	55	34.1	74	1.3
3 rd of FY02	59	21.1	113	1.9
4 th of FY02	66	27.6	144	2.2
1 st of FY03	56	34.7	72	1.3
2 nd of FY03	55	22.5	97	1.8

3 rd of FY03	58	25.0	105	1.8
4 th of FY03	63	22.6	103	1.6
1 st of FY04	56	27.4	56	1.0
2 nd of FY04	55	42.1	24	0.4
3 rd of FY04	63	59.9	5	0.1
4 th of FY04	62	62.0	0	0.0
1 st of FY05 (current)	55	55.0	0	0.0
Cumulative Total	815	498.5	931	1.1
Average/Quarter	58.2	35.6	66.5	1.1

Table 5-2. Summary of Operational Down Time

Quarter	Equipment/ Truck Problems/Calibration (hrs)	No HPT/ Operator Support (hrs)	Security Measures (hrs)	No Charge Code or Administrative (hrs)	Moving Truck (hrs)	Weather (hrs)	Misc. / Fresh Air Requirement (hrs)	Total Down Time (hrs)
4 th of FY01	64	130	20	27	20	3	0	264
1 st of FY02	107	84	51	44	14	13	4	317
2 nd of FY02	143	40	24	58	9	18	15	307
3 rd of FY02	31	62	0	36	27	8	26	190
4 th of FY02	81	122	0	0	37	0	8	248
1 st of FY03	71	107	0	18	18	0	98	312
2 nd of FY03	62	126	0	0	10	0	0	198
3 rd of FY03	51	149	0	0	12	0	13	225
4 th of FY03	45	136	0	0	16	6	0	203
1 st of FY04	6	198	0	0	12	22	9	247
2 nd of FY04	178	95	0	0	6	98	2	379
3 rd of FY04	26	18	0	9	2	0	424	479
4 th of FY04	0	0	0	0	0	0	513	513
1 st of FY05 (current)	0	490	0	0	0	0	0	490
Cumulative Total	865	1757	95	192	183	168	1112	4372
Average/Quarter	61.8	125.5	6.8	13.7	13.1	12.0	79.4	312.3

6.0 Summary

No RAS monitoring has been performed during the past two quarters. A total of 931 routine monitoring events (110 retrieval events) have been performed since the beginning of the project in June 2001. An additional 104 events (16 events during the 1st quarter of FY 2005) using the NMLS were provided. To date, the high priority boreholes in all tank farms have been monitored at least once, but the recommended monitoring frequency has not been met for these boreholes. There are 310 lower priority boreholes within the single-shell tank farms that have yet to be monitored.

Evidence of possible contaminant movement has been detected in 29 boreholes in nine tank farms. Of these 29 boreholes, data collected from two boreholes indicate movement to a degree that can be confirmed over a short time interval. Of the remaining 27 boreholes, it is likely that the elapsed time between monitoring events is not sufficient to detect subtle changes in contaminant profile, suggesting relatively slow movement of contaminants in the vadose zone. In general, intervals where discernable movement of contaminants through the vadose zone is occurring within short periods of time (i.e., less than 1.5 years) appear to be very limited. This finding, corroborated with continued measurements, will be useful to select appropriate remedial actions for tank farm closure and/or removal of contaminated soil.

7.0 Future Monitoring Operations

Due to regulatory commitments and operating limitations in tank farms, DOE-ORP and their contractor have re-focused the monitoring effort from routine monitoring to retrieval monitoring. Therefore, the monitoring schedule for the RAS will be built on the monitoring requirements associated with the various retrieval projects. This schedule will also apply to the NMLS logging required for the retrieval projects. Appendix F provides a summary of boreholes scheduled for retrieval monitoring through the end of the 2nd quarter of FY 2005.

A new, portable logging system capable of recording gross gamma and moisture measurements simultaneously has been ordered and should be ready to begin monitoring in support of the retrieval projects during the 2nd quarter of FY 2005. This system will replace the RAS and NMLS and will be operated by the Hanford Atomic Metal Trades Council (HAMTC) operators. It is planned that the RAS be left intact for future routine monitoring.

High rate logging has not been performed in the tank farms since FY 2002. Because the areas that exhibit high activity contain the greatest contaminant inventory in the farms, it is essential to monitor these areas for changes on a more frequent basis. Approximately 25 boreholes require high rate logging, which would require a level of effort of approximately 2 months.

8.0 Recommendations

The monitoring program in the single-shell tank farms was initiated in 2000 after the initial success of the Vadose Zone Characterization Project. Experience gained from the past baseline characterization efforts and current activities during this period suggest significant changes in the monitoring of tank farms. Based upon this experience, significant issues and recommendations for improvement are discussed below.

8.1 Routine Monitoring Program

Vadose zone monitoring activities in the single-shell tank farms are performed under the control of the ORP tank farm contractor with oversight and technical input from Stoller. In the past 9 months, there has been effectively no routine monitoring in the single-shell tank farms. Routine monitoring operations are dependent upon personnel employed by the tank farms contractor, whose primary goal is waste retrieval.

The primary reason routine monitoring activities have been discontinued are the prioritization of resources and personnel to retrieval operations and tank farm access restrictions arising from health and safety concerns.

Comparison of ongoing monitoring data with baseline and historical data is important in unraveling the complex leak history in the sing-shell tank farms, assessing stability of individual contaminant plumes, and determining the suitability of individual tanks for sluicing operations. In the vicinity of C-106, for example, routine monitoring data has detected continued downward movement in a ^{60}Co plume on the north side of the tank. Baseline data indicate that the plume likely originated between C-108 and C-109. It appears to be moving downward and to the east in the region between C-109 and C-106. Routine monitoring activities detected this movement well before retrieval operations were initiated in C-106, and thus established that the observed increases in subsurface activity were not related to C-106 retrieval operations. In the absence of a routine monitoring program, it is possible that observed changes in this plume would have been attributed to the retrieval operation, resulting in an erroneous determination that a leak had occurred. Clearly defined and uniformly implemented requirements for routine and tank-retrieval leak detection monitoring will improve credibility and the potential acceptability of future Hanford remedial actions.

It is strongly recommended that routine monitoring activities be re-emphasized and performed where the monitoring activity is given a high priority in resource allocation at tank farms.

8.2 Centralize Responsibility for Geophysical Monitoring Technology, Equipment, and Data Interpretation

New, low-cost portable logging systems can be used for the monthly monitoring events now performed by the RAS and SGLS; they can also be used for more frequent measurements, replacing the existing manual moisture monitoring units. This improves overall data comparability and reduces the potential for false detections based on increase in observed

moisture. Under the current monitoring approach, any increase in moisture observed with the manual moisture gauges results in an immediate need for gamma logging to determine if a leak has in fact occurred. Also, manual moisture monitoring is subject to data transcription errors and to errors associated with slight variations in depth between successive measurements. In many cases, a specific monitoring point is selected at a peak in the neutron moisture log. When subsequent manual moisture measurements are made, slight variations in detector depth may appear as changes in moisture content. The portable logging equipment will provide combined and continuous neutron moisture and gamma activity measurements over a specified depth interval with electronic data recording. This eliminates the potential for transcription errors and provides a continuous profile, which allows depth errors to be more readily recognized. Additionally, new technologies such as High Resolution Resistivity (HRR) are being investigated without benefit of baseline comparison plans or integration into the ongoing monitoring or retrieval monitoring programs.

At present, RAS and NMLS data are processed and evaluated by Stoller, while the manual moisture measurements are reported to CHG. This creates a situation wherein discrepancies between the two data sets may not be immediately recognized.

The designation of a single contractor responsible for geophysical logging to collect, evaluate, and manage borehole and vadose zone monitoring technological needs, equipment, and measurement data would significantly improve the effectiveness and quality of Hanford geophysical data collection and interpretation.

References

Barton, W.B., 2003. *Process Control Plan for Saltcake Dissolution Retrieval Demonstration in Tank 241-S-112*, RPP-15085, Rev. 1, CH2M HILL Hanford Group, Inc., Richland, Washington.

Reynolds, D.A., 2003. *Process Control Plan for Tank 241-C-106 Acid Dissolution*, RPP-16462, Rev. 2, CH2M HILL Hanford Group, Inc., Richland, Washington.

U.S. Department of Energy (DOE), 2004. *Hanford Tank Farms Vadose Zone Monitoring Project, Annual Monitoring Report for Fiscal Year 2003*, GJO-2004-554-TAC, Revision 0, Grand Junction Office, Grand Junction, Colorado.

U.S. Department of Energy (DOE), 2003. *Hanford Tank Farms Vadose Zone Monitoring Project, Baseline Monitoring Plan*, GJO-HGLP 1.8.1, Revision 0, Grand Junction Office, Grand Junction, Colorado.

Appendix A
Boreholes Monitored During 1st Quarter of FY 2005

Table A-2. Retrieval Boreholes Monitored During FY 2004

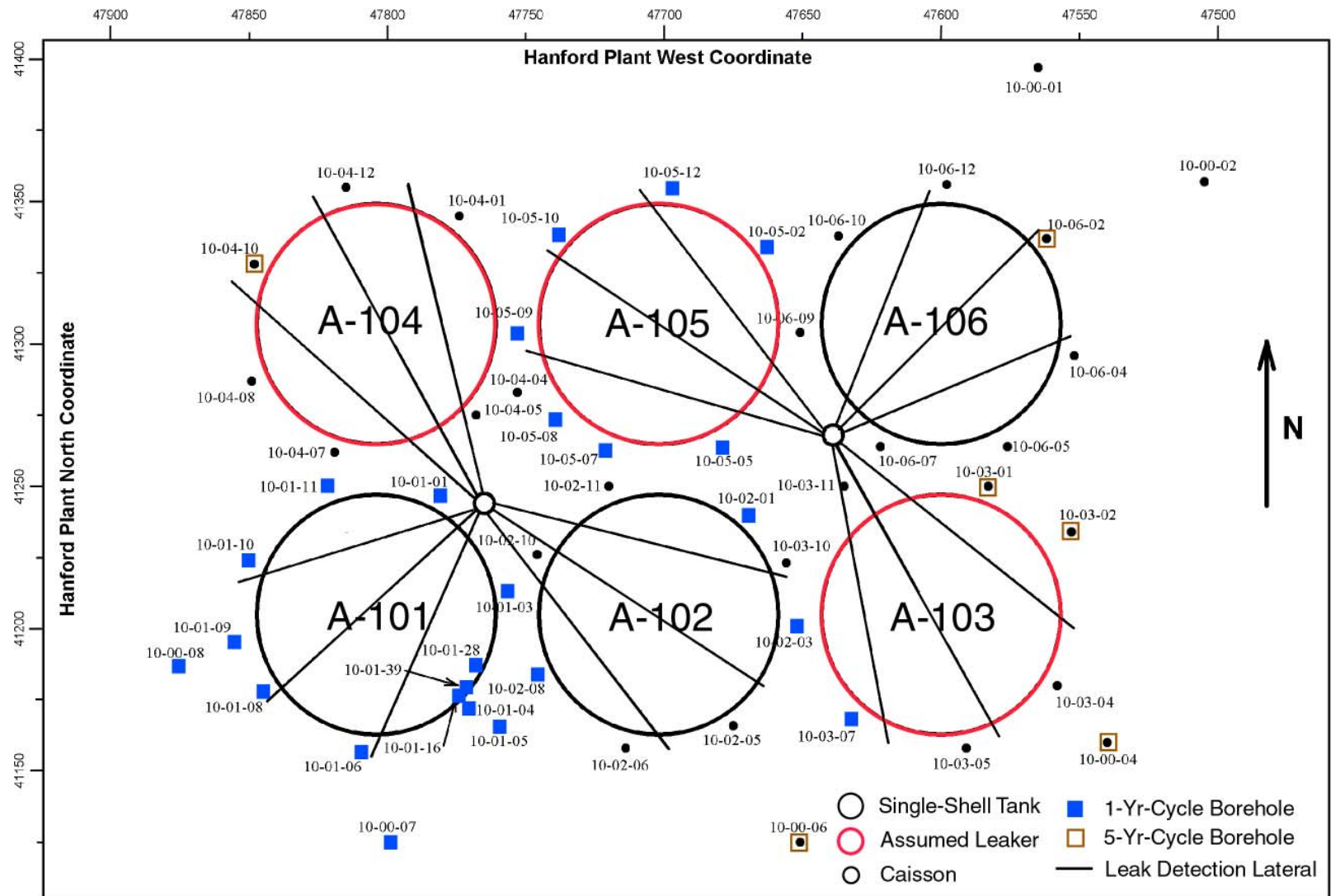
Borehole Number	Tank	Top	Bottom	Footage	Rerun Footage	Next Log Date	RAS Event A	RAS Event B	RAS Event C	RAS Event D	RAS Event E	RAS Event F	Ras Event G	Ras Event H	Total FY 2004 Events	Total Events (to date)	Comment
30-00-01	C-106	0	65	65		04/06/04	04/24/02	01/16/03	04/28/03	07/22/03	09/15/03	11/03/03	12/02/03	03/01/04	3	8	No apparent change, C-106 Retrieval
30-05-02	C-105	5	127	122	30	03/26/04	04/22/02	01/29/03	04/29/03	07/23/03	09/17/03	10/23/03	12/15/03	02/19/04	3	8	No apparent change, C-106 Retrieval
30-06-02	C-106	0	122	122		03/30/04	01/27/03	04/28/03	07/21/03	09/16/03	10/21/03	01/26/04	02/23/04		3	7	No apparent change, C-106 Retrieval
30-06-03	C-106	0	98	98		03/30/04	01/23/03	04/28/03	07/21/03	09/16/03	10/22/03	12/02/03	02/23/04		3	7	No apparent change, C-106 Retrieval
30-06-04	C-106	0	129	129		04/01/04	09/11/02	01/27/03	04/29/03	07/23/03	09/17/03	10/31/03	12/22/03	02/25/04	3	8	No apparent change, C-106 Retrieval
30-06-09	C-106	5	98	93	30	03/26/04	04/22/02	01/22/03	04/22/03	07/22/03	09/10/03	10/23/03	12/12/03	02/19/04	3	8	No apparent change, C-106 Retrieval
30-06-10	C-106	0	128	128		04/02/04	04/23/02	01/23/03	04/22/03	07/22/03	09/08/03	11/03/03	12/22/03	02/26/04	3	8	Possible change 124-126 ft Co-60, C-106 Retrieval
30-06-12	C-106	0	98	98		04/06/04	04/24/02	01/24/03	04/29/03	07/22/03	09/11/03	10/22/03	12/08/03	03/01/04	3	8	No apparent change, C-106 Retrieval
30-08-02	C-108	30	99	69		03/17/04	09/11/02	09/12/02	01/21/03	05/05/03	07/30/03	11/04/03	12/17/03	02/17/04	2	8	Def. change Co-60 49-75 ft, down, C-106 Retrieval
30-09-06	C-109	30	98	68		03/20/04	04/23/02	01/29/03	05/05/03	07/30/03	10/31/03	12/12/03	02/20/04		2	7	No apparent change, C-106 Retrieval
30-09-07	C-109	30	121	91		03/17/04	09/11/02	01/16/03	05/02/03	07/30/03	10/29/03	12/15/03	02/17/04		2	7	No apparent change, C-106 Retrieval
40-09-06	S-109	0	98	98		03/12/04	06/05/02	03/11/03	08/27/03	10/15/03	11/24/03	02/05/04			3	6	No apparent change; S-112 Retrieval
40-11-08	S-111	0	97	97	20	03/11/04	06/03/02	10/17/03	11/25/03	02/04/04					3	4	No apparent change, S-112 Retrieval
40-11-09	S-111	0	98	98	10	03/12/04	06/05/02	06/18/03	10/16/03	12/01/03	02/05/04				3	5	No apparent change, S-112 Retrieval
40-12-02	S-112	0	99	99		03/12/04	06/05/02	03/12/03	08/27/03	10/16/03	11/24/03	02/05/04			3	6	No apparent change; S-112 Retrieval
40-12-04	S-112	0	126	126		03/11/04	06/04/02	03/10/03	08/22/03	10/09/03	11/25/03	02/04/04			3	6	No apparent change; S-112 Retrieval
40-12-06	S-112	0	144	144	30	03/16/04	06/04/02	03/10/03	08/21/03	10/14/03	11/19/03	02/09/04			3	6	No apparent change; S-112 Retrieval
40-12-07	S-112	0	98	98		03/13/04	06/04/02	03/11/03	08/26/03	10/08/03	11/19/03	02/06/04			3	6	No apparent change; S-112 Retrieval
40-12-09	S-112	0	98	98		03/13/04	06/05/02	03/11/03	08/27/03	10/14/03	11/17/03	02/06/04			3	6	No apparent change; S-112 Retrieval
40-03-03	S-103	0	122	122	10	05/21/04	09/16/02	04/15/04							1	2	No apparent change, S-102 Retrieval
40-02-08	S-102	0	99	99	10	05/20/04	09/17/02	07/07/03	04/14/04						1	3	No apparent change, S-102 Retrieval
40-02-07	S-102	0	95	95		05/19/04	09/17/02	07/07/03	04/13/04						1	3	No apparent change, S-102 Retrieval
40-02-10	S-102	0	99	99		05/19/04	09/17/02	07/01/03	04/13/04						1	3	No apparent change, S-102 Retrieval
40-02-11	S-102	0	100	100		05/18/04	09/19/02	07/02/03	04/12/04						1	3	No apparent change, S-102 Retrieval
Total Retrieval Monitoring Events FY 2004 =															59		

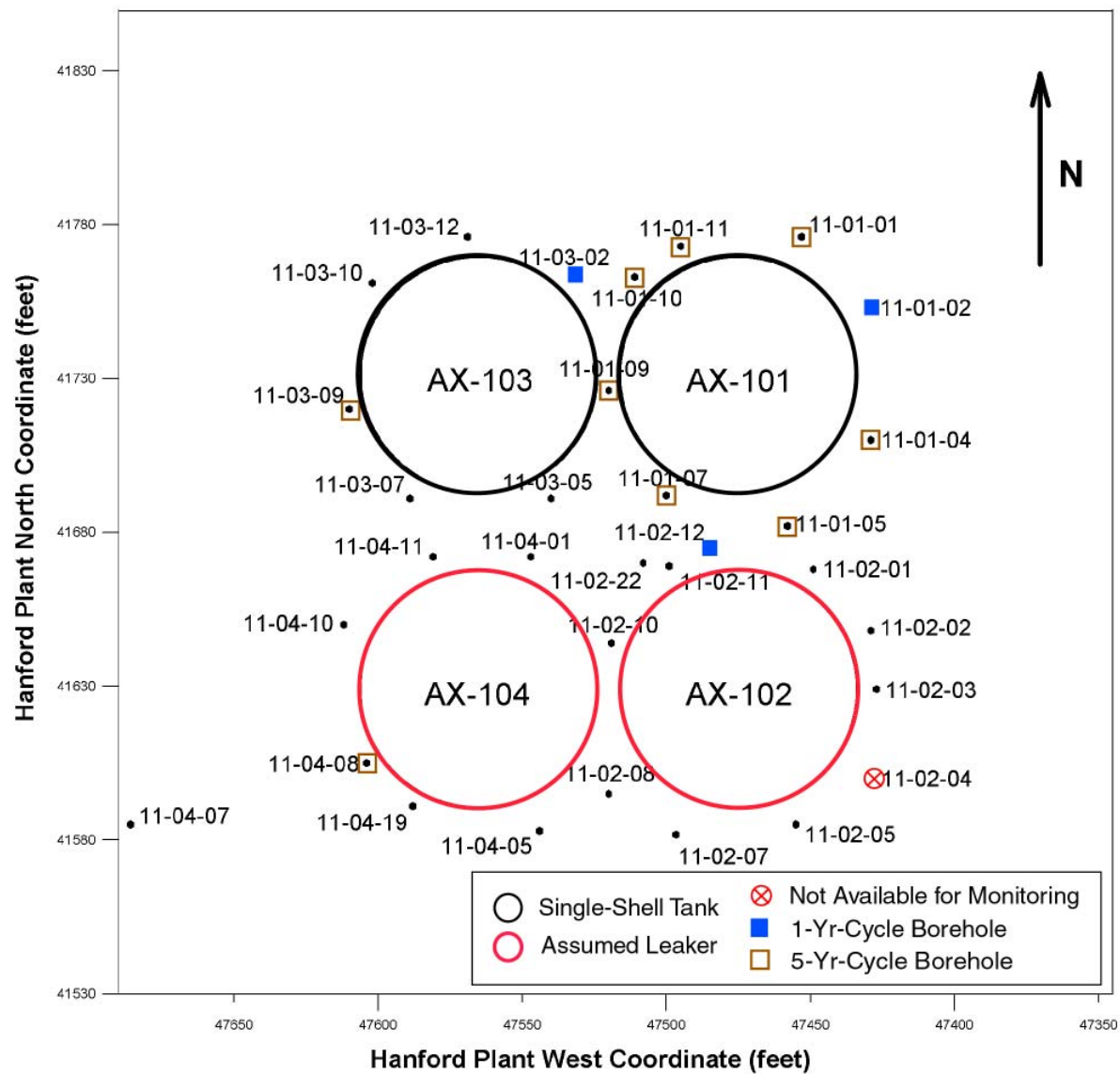
Note: Boreholes 30-08-02, 30-09-06, and 30-09-07 were counted as routine monitoring boreholes during the first logging event of FY 2004.

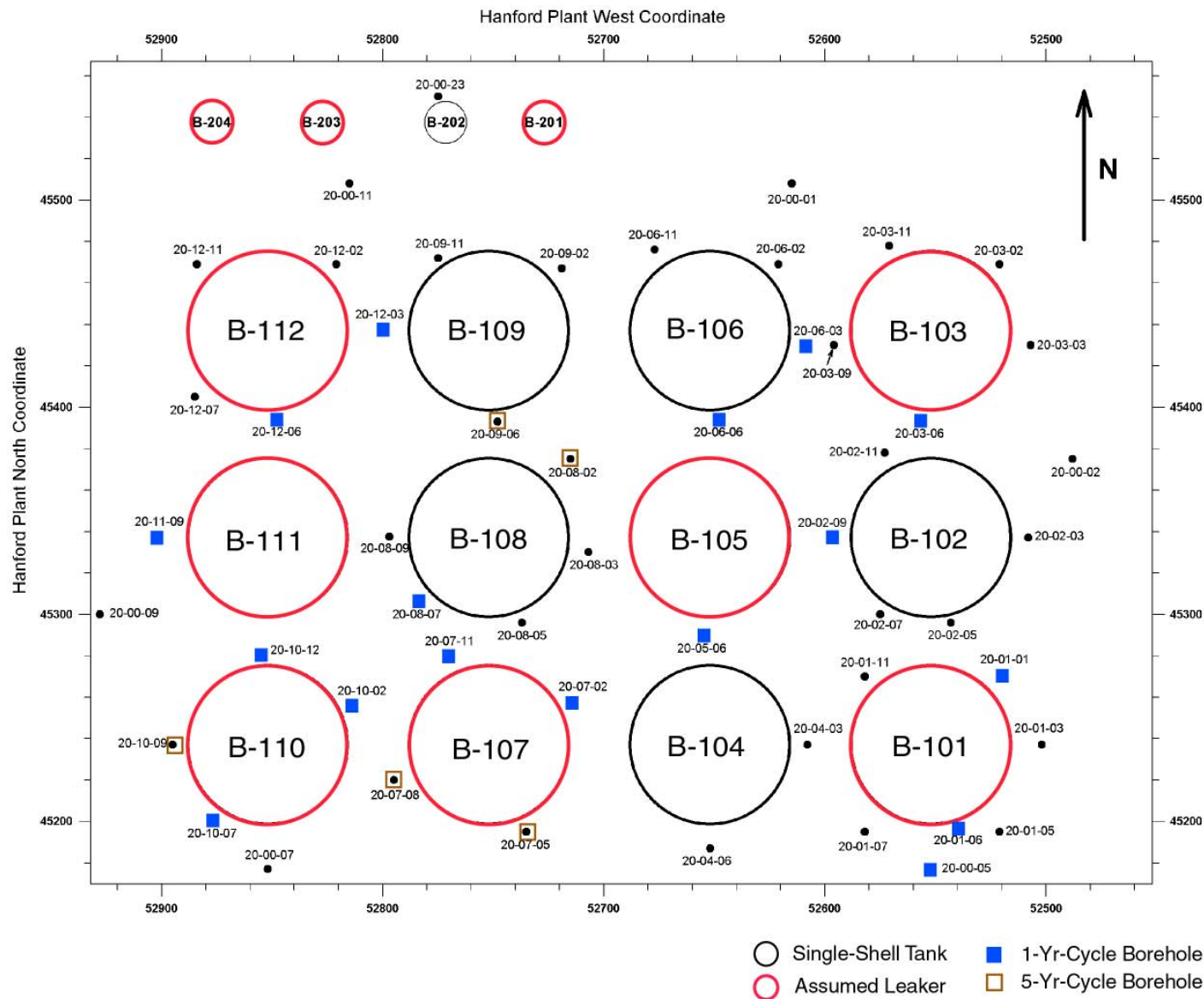
Appendix B

Tank Farm Maps with Monitoring Borehole Locations and Status

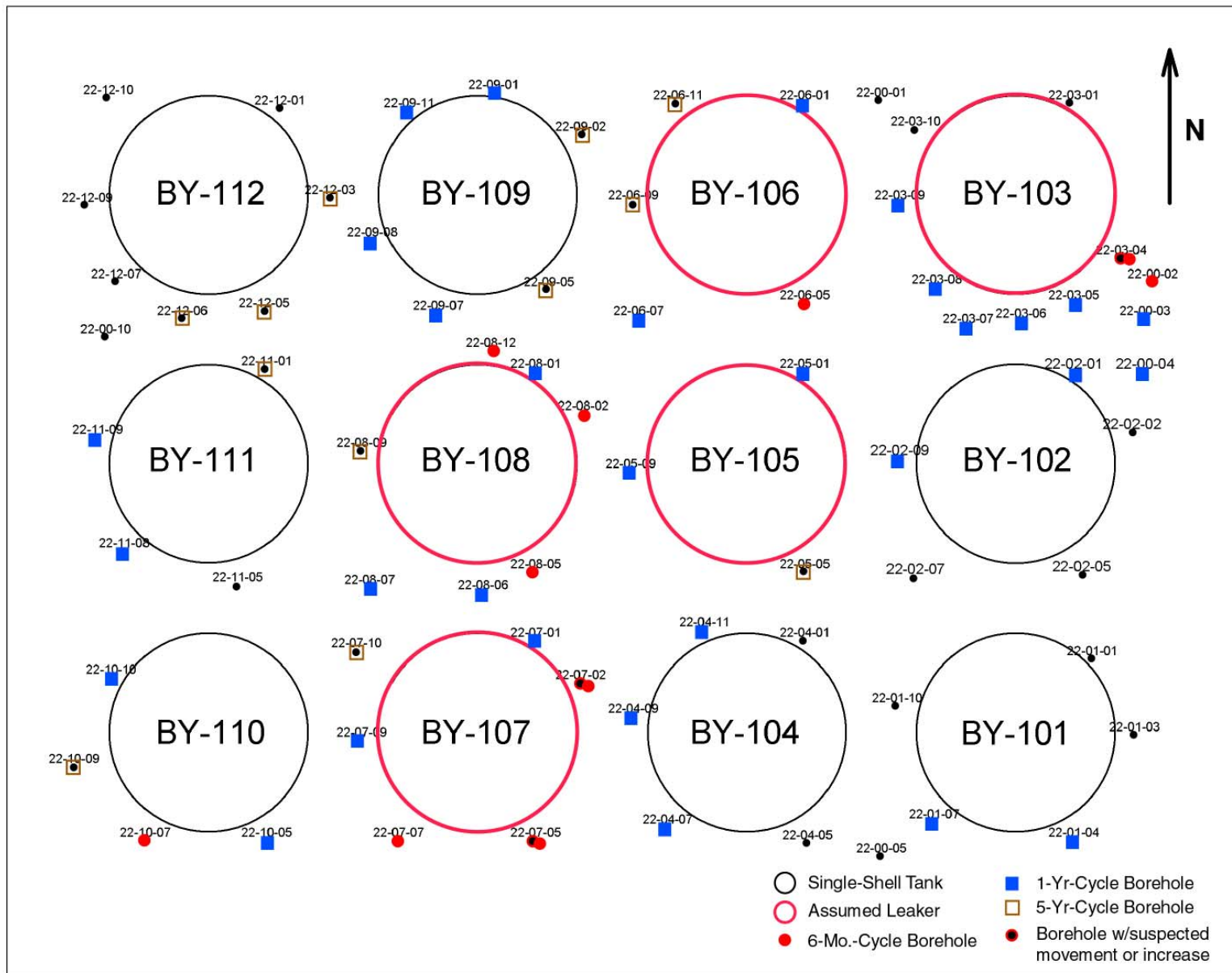
Note: This appendix contains a map of each single-shell tank farm with the locations of all boreholes used for monitoring. Each borehole location is identified by a label (borehole number) and a symbol. The symbols are used to represent the monitoring frequency of the borehole, and if any movement has been identified in a particular borehole. A black dot means the borehole has not been monitored since the SGLS baseline was performed. Boreholes that are not available for monitoring are also identified.

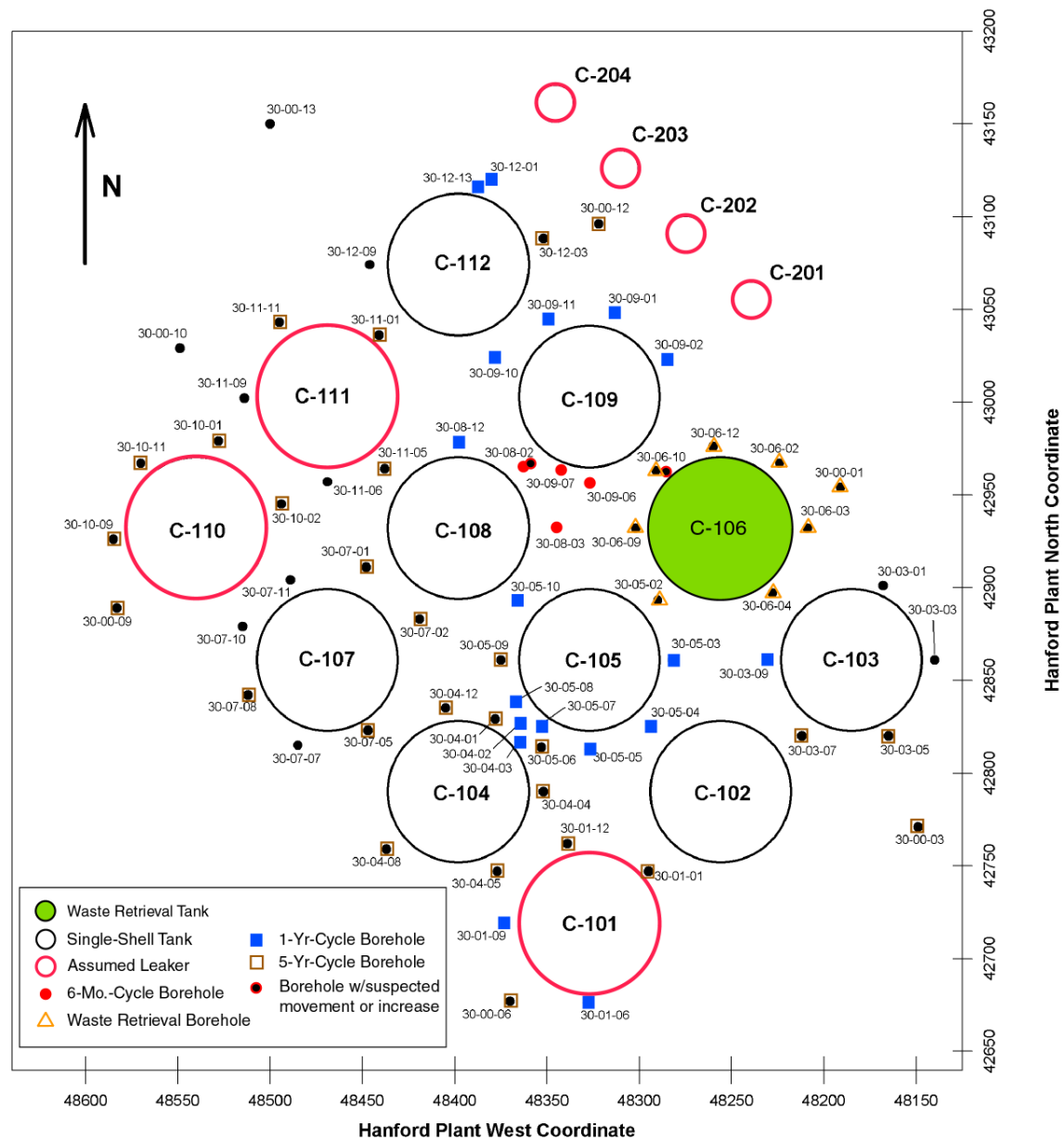


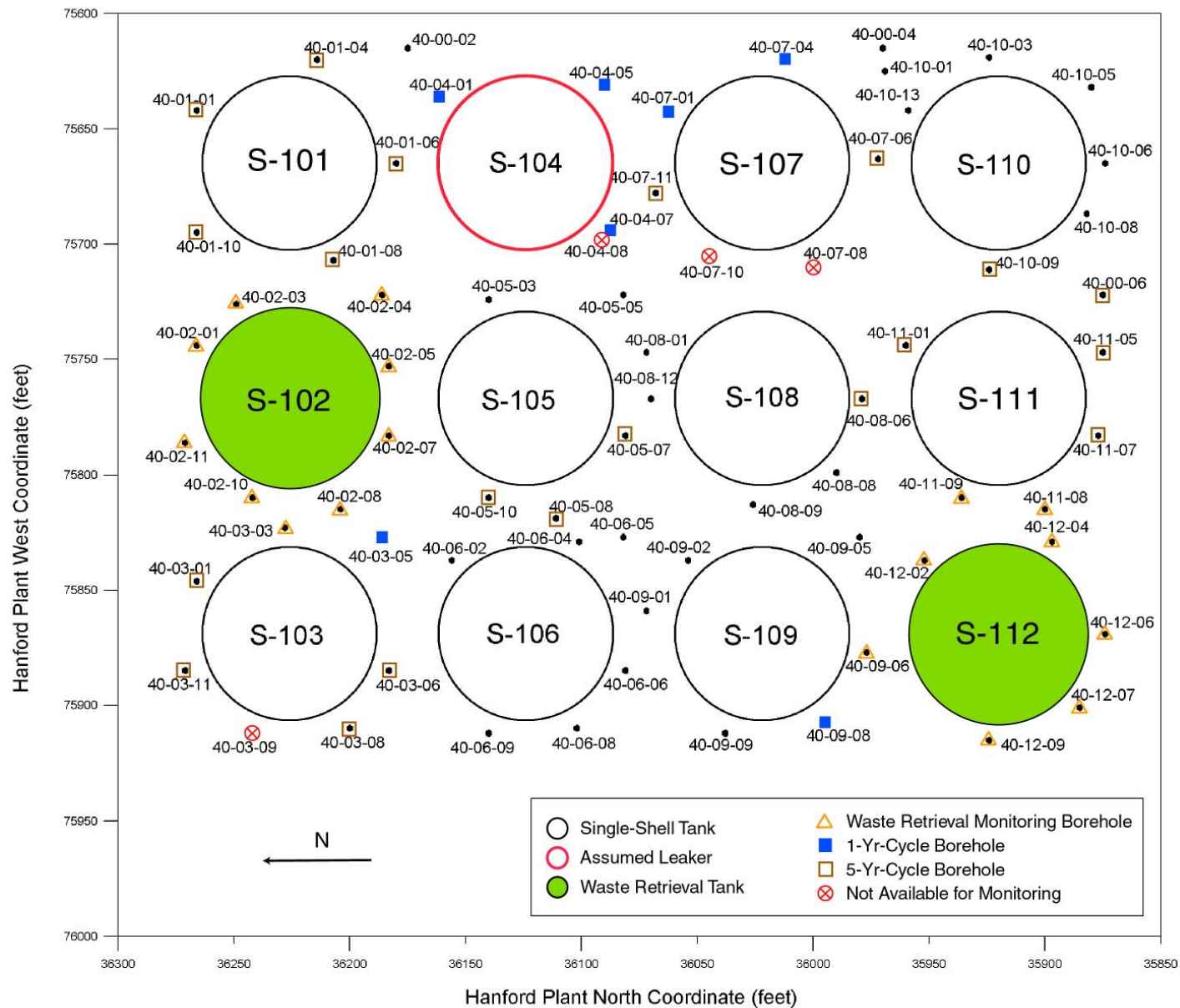


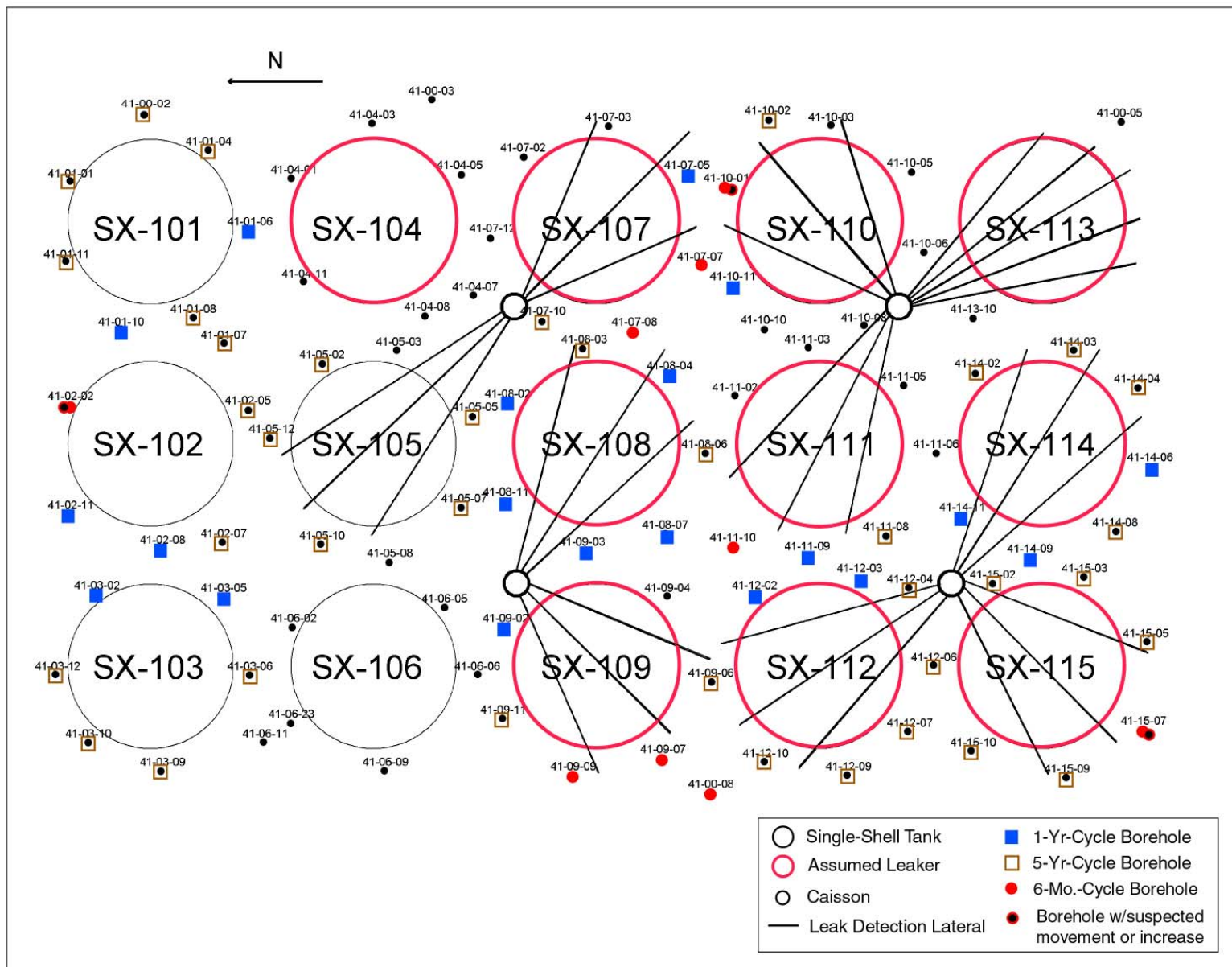


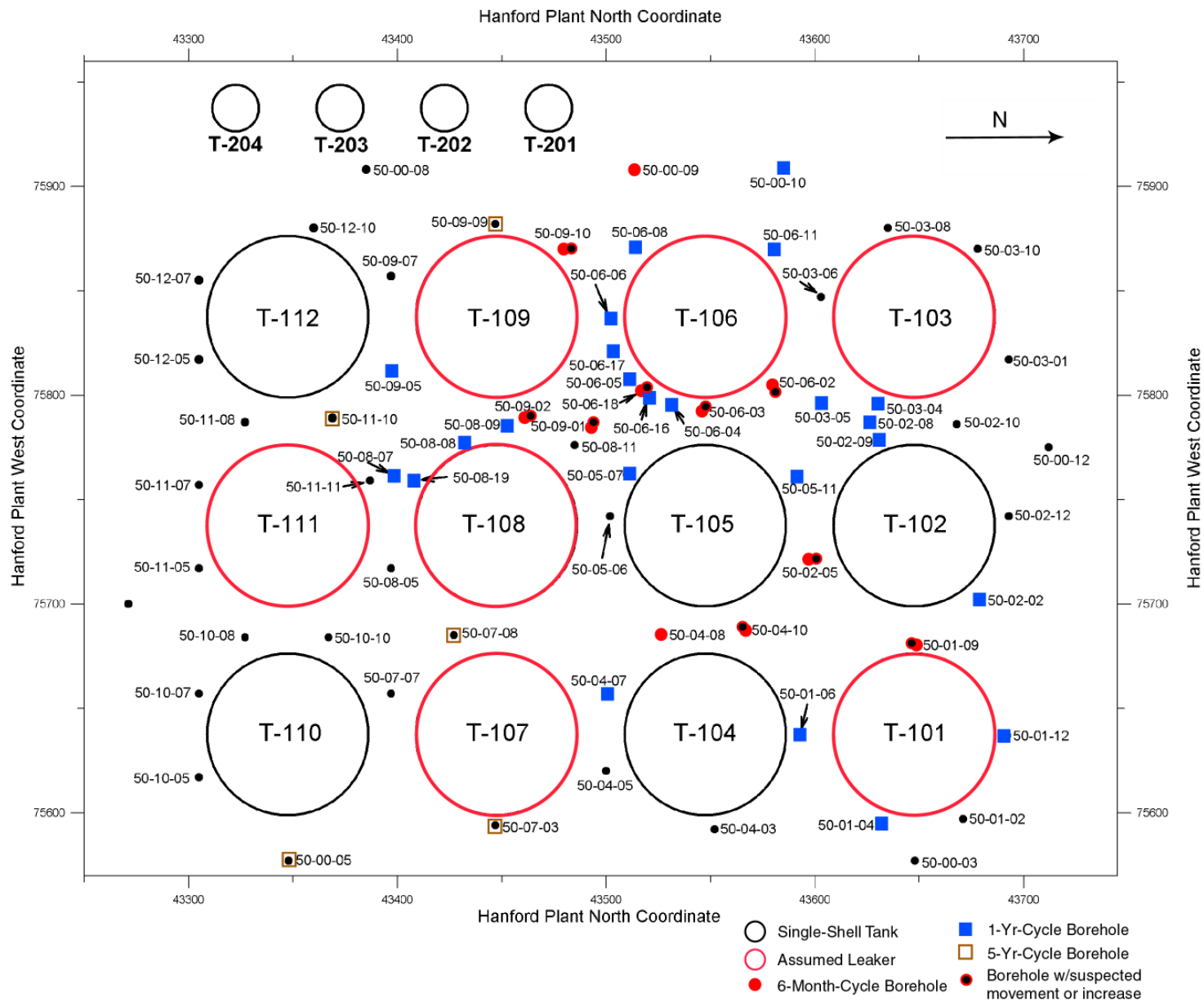


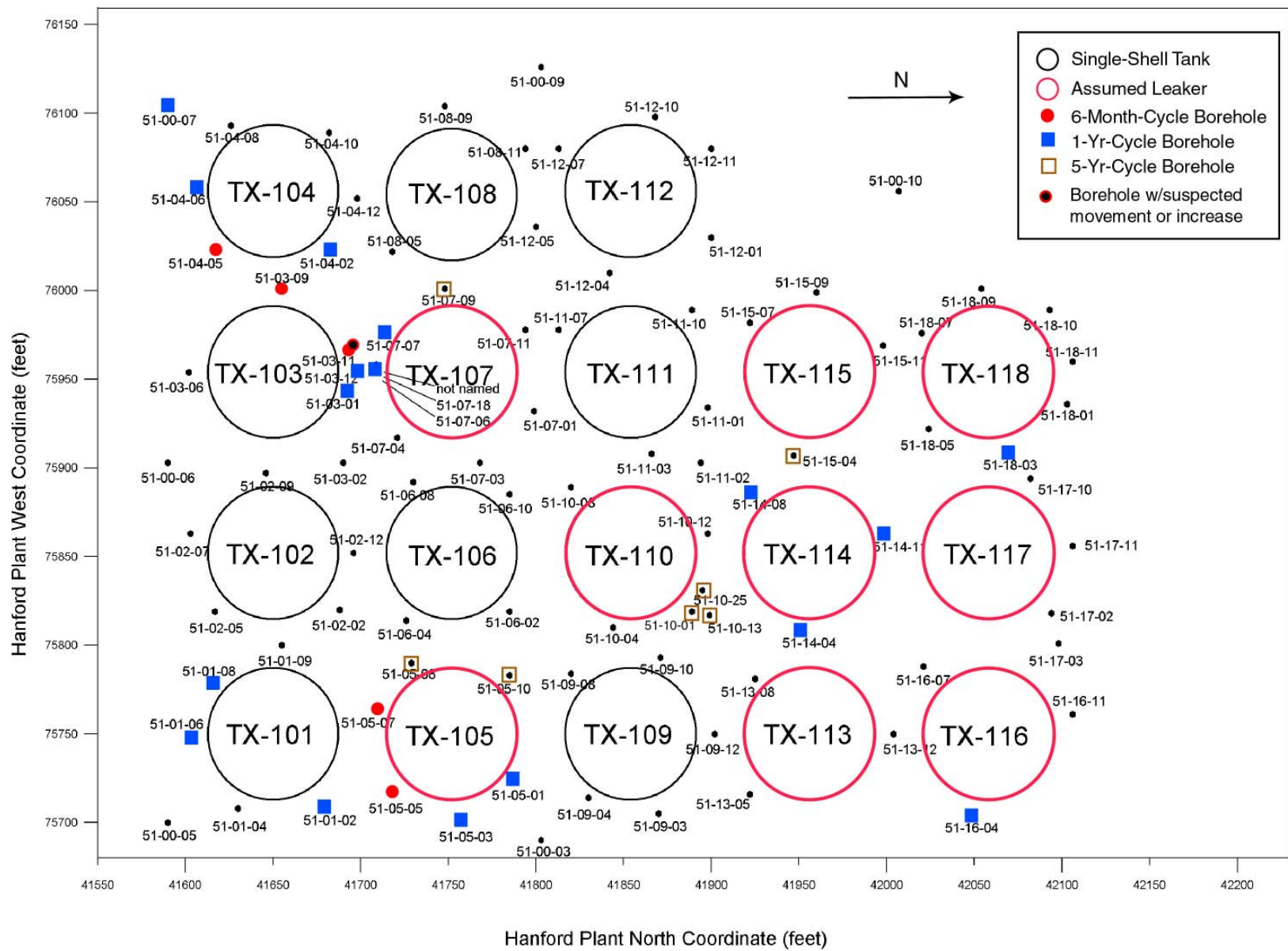


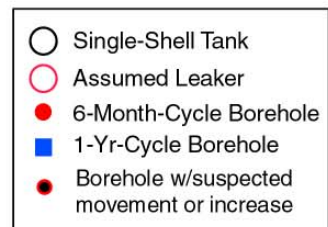
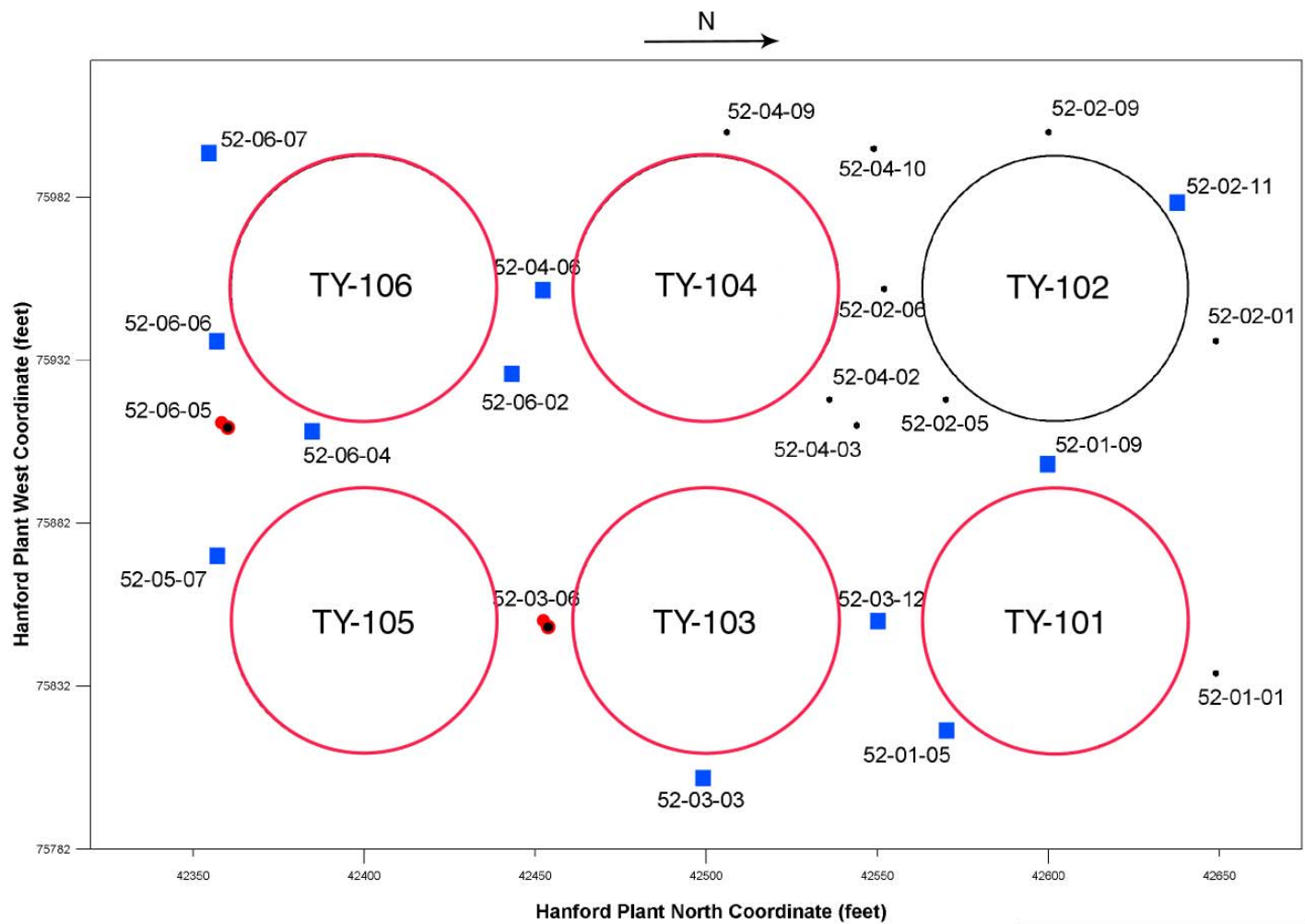


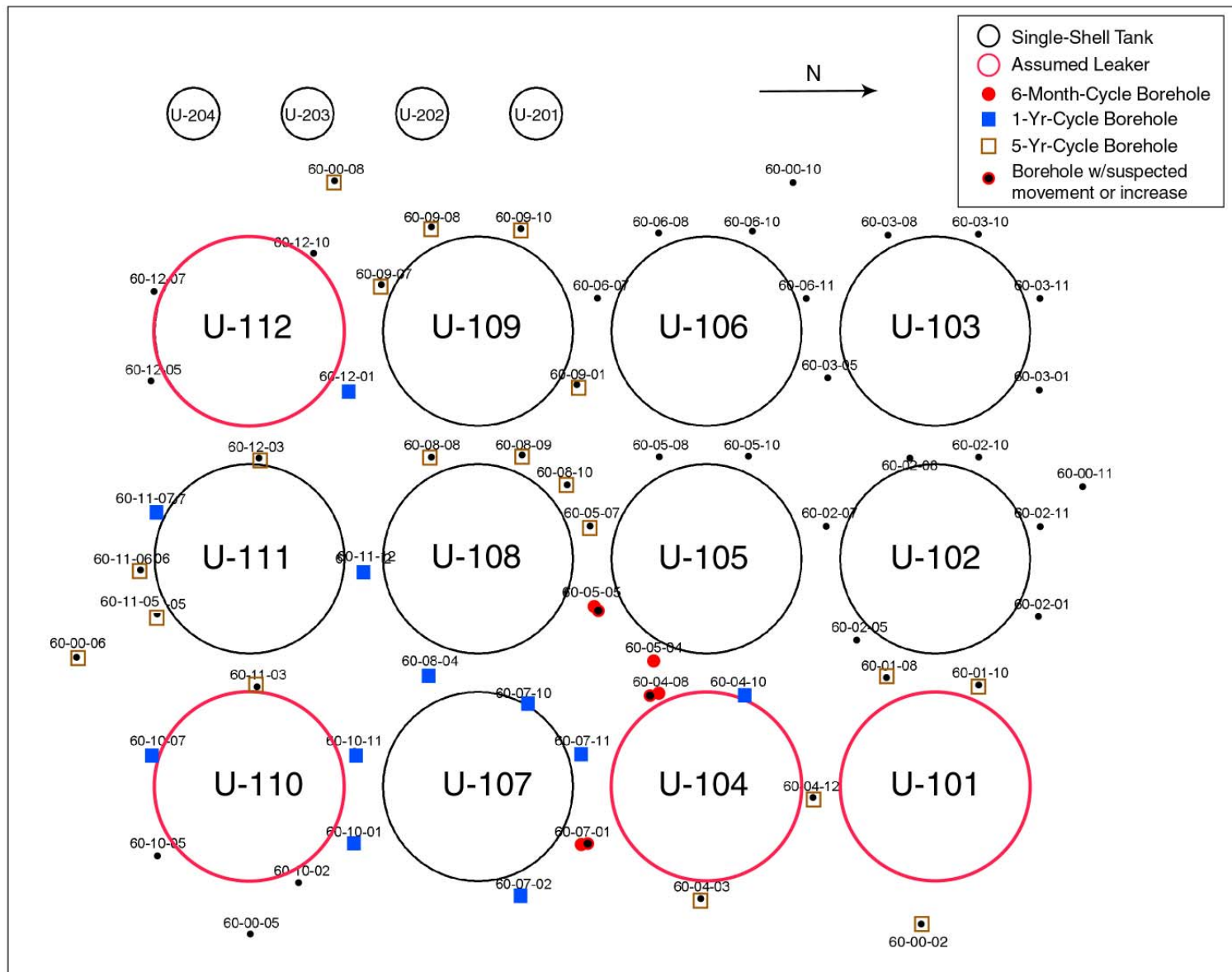












Appendix C
Tank C-106 Retrieval Monitoring Log Plots



**Hanford Single Shell Tank Farms
Borehole Geophysics Summary Sheet**

Page 1 of 1

Borehole Number (Alias): 30-05-02 (299-E27-70) (A6695)

Borehole Information

Site: C Farm, Tank C-105

Coordinates (HAN Plant):	North: 42893	West: 48290	Elevation (ft): 645.70
Coordinates (WA Plane):	North: 136557.039	East: 575172.445	Elevation (m): 197.972
Drill Date: 11/30/1972	Type: Cable Tool	Depth (ft): 127.5	Depth Datum: TOC
Depth/Water (ft): Dry	D/W Date: 12/2/03	D/W Reference: Stoller	
Comments: None.			

Casing Information

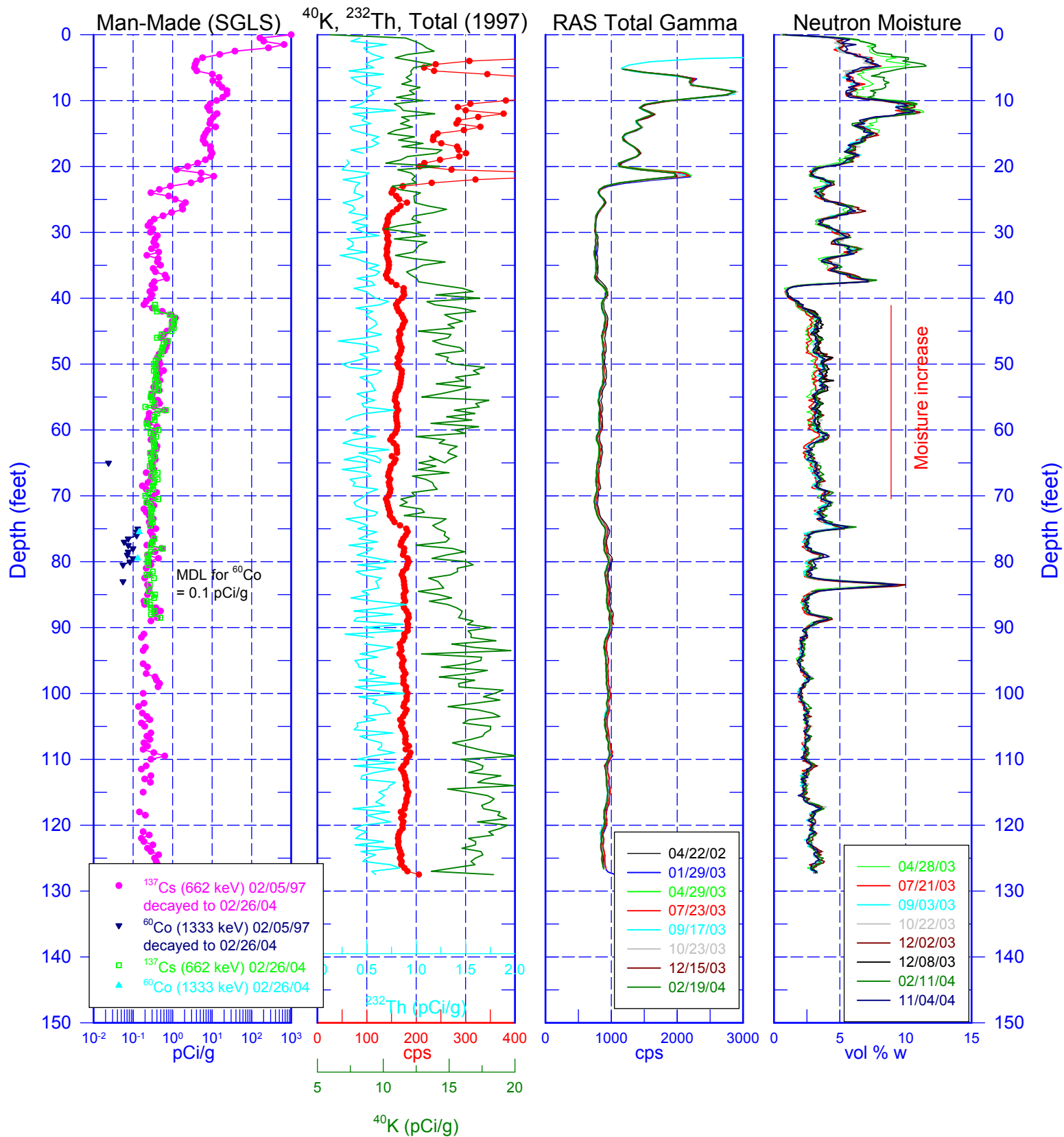
Type	Top(ft)	Bottom (ft)	ID (in)	Thick. (in)	Stickup (ft)	Reference
Steel	0	130	6	0.28	0	Stoller

Log Run Information

Log Date	System	Detector	Event	Log int. (ft)	Contractor	Comments
02/05/97	SGLS	G2A	NA	0-127.5	MACTEC-ERS	Baseline
04/22/02	RAS	Large	A	30-90	MACTEC-ERS	No Change
01/29/03	RAS	Large-New	B	5-127	Stoller	No Change
04/29/03	RAS	Large-New	C	5-127	Stoller	No Change
07/23/03	RAS	Large-New	D	5-127	Stoller	No Change
04/28/03	NMLS	Moisture	1	0-127.25	Stoller	Moisture Baseline
07/21/03	NMLS	Moisture	2	0-127.25	Stoller	No Change
09/08/03	NMLS	Moisture	3	0-127.25	Stoller	No Change
09/17/03	RAS	Large-New	E	0-127	Stoller	No Change
10/22/03	NMLS	Moisture	4	0-127.25	Stoller	No Change
10/23/03	RAS	Large-New	F	5-127	Stoller	No Change
12/02/03	NMLS	Moisture	5	0-127.25	Stoller	No Change
12/08/03	NMLS	Moisture	6	40-60	Stoller	No Change
12/15/03	RAS	Large-New	G	5-127	Stoller	No Change
02/11/04	NMLS	Moisture	7	0-127.25	Stoller	No Change
02/19/04	RAS	Large-New	H	5-127	Stoller	No Change
02/26/04	SGLS	G2A	NA	40-90	Stoller	No Change
11/04/04	NMLS	Moisture	8	0-127.25	Stoller	No Change

Tank C-105

30-05-02





Borehole Information

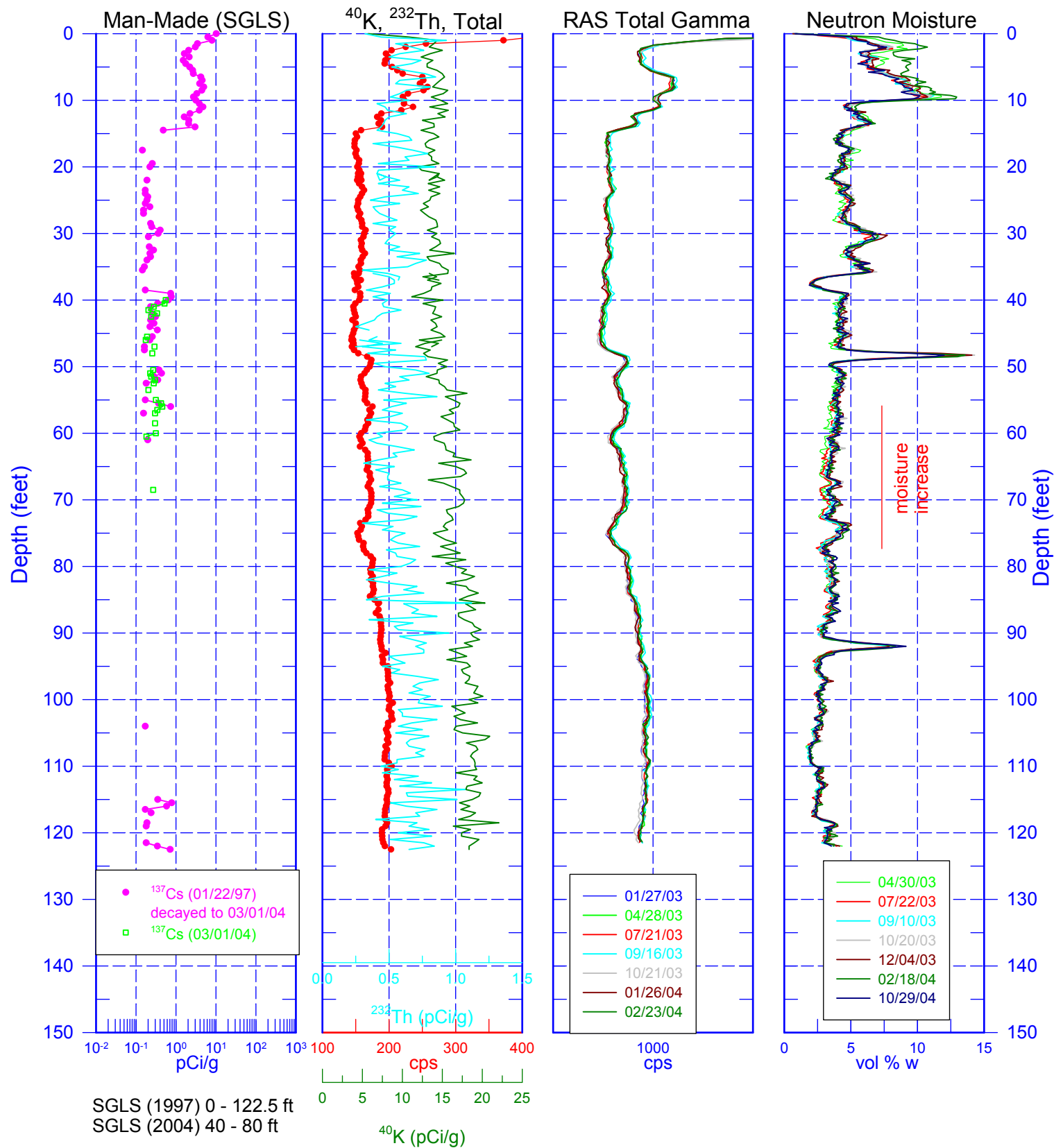
Coordinates (HAN Plant):	North: 42967	West: 48244	Elevation (ft): 645.33
Coordinates (WA Plane):	North: 136579.598	East: 575192.544	Elevation (m): 197.644
Drill Date: 11/30/1972	Type: Cable Tool	Depth (ft): 122.5	Depth Datum: TOC
Depth/Water (ft): Dry	D/W Date: 2/18/04	D/W Reference: Stoller	
Comments: None.			

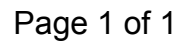
Type	Top(ft)	Bottom (ft)	ID (in)	Thick. (in)	Stickup (ft)	Reference
Steel	0	125	6	0.28	0	Stoller

[illegible]

Tank C-106

30-06-02





Borehole Information

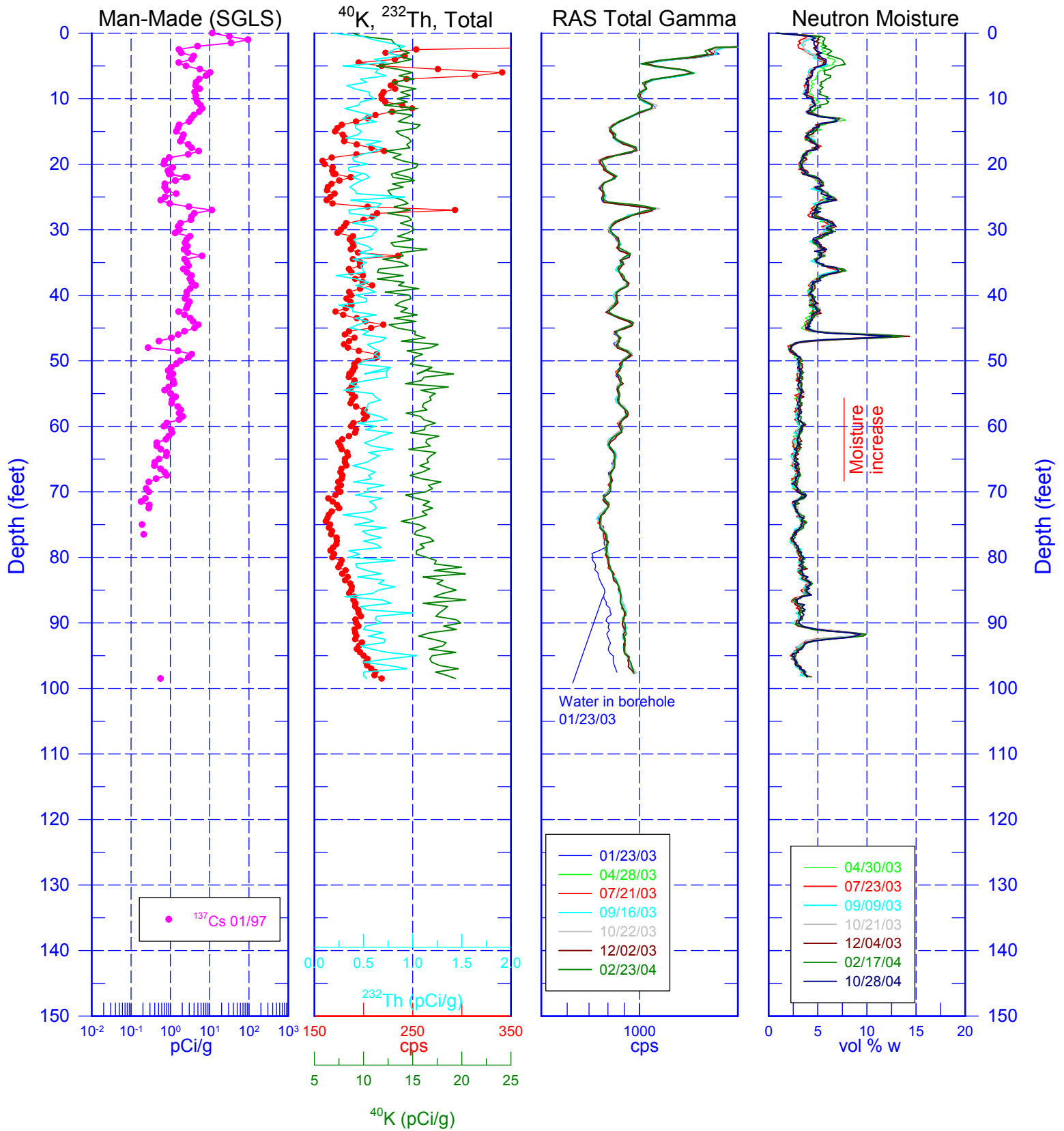
Coordinates (HAN Plant):	North: 42932	West: 48209	Elevation (ft): 644.80
Coordinates (WA Plane):	North: 136569.106	East: 575197.02	Elevation (m): 197.649
Drill Date: 6/30/1974	Type: Cable Tool	Depth (ft): 98.5	Depth Datum: TOC
Depth/Water (ft): Dry	D/W Date: 2/17/04	D/W Reference: Stoller	
Comments: The water level changes frequently in this borehole. The water level was at 83 ft on 4/28/03			
Surface water enters borehole.			

Type	Top(ft)	Bottom (ft)	ID (in)	Thick. (in)	Stickup (ft)	Reference
Steel	0	100	6	0.28	0	Stoller

[illegible]

Tank C-106

30-06-03





**Hanford Single Shell Tank Farms
Borehole Geophysics Summary Sheet**

Page 1 of 1

Borehole Number (Alias): 30-06-04 (299-E27-73) (A6698)

Borehole Information

Site: C Farm, Tank C-106

Coordinates (HAN Plant):	North: 42897	West: 48288	Elevation (ft): 644.71
Coordinates (WA Plane):	North: 136558.321	East: 575191.287	Elevation (m): 197.894
Drill Date: 11/30/1972	Type: Cable Tool	Depth (ft): 129.5	Depth Datum: TOC
Depth/Water (ft): Dry		D/W Date: 12/10/03	D/W Reference: Stoller
Comments: None.			

Casing Information

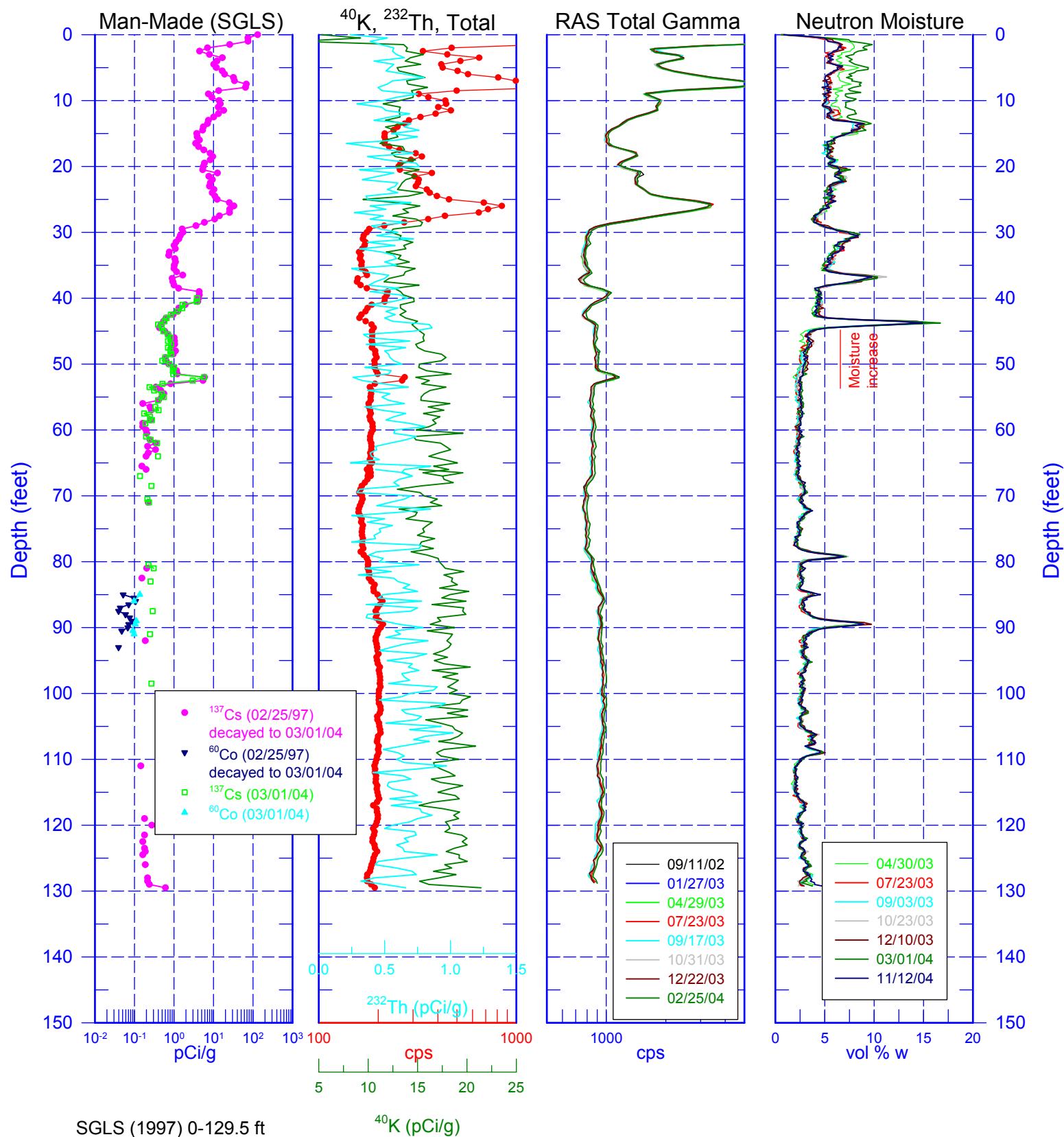
Type	Top(ft)	Bottom (ft)	ID (in)	Thick. (in)	Stickup (ft)	Reference
Steel	0	130	6	0.28	0	Stoller

Log Run Information

Log Date	System	Detector	Event	Log int. (ft)	Contractor	Comments
1993	RLS	Unk	NA	0-123	WHC	C-106 Investigation
2/5/1997	SGLS	G1A	NA	0-129.5	MACTEC-ERS	Baseline
9/11/2002	RAS	Large	A	20-100	Stoller	No Change
1/27/2003	RAS	Large-New	B	0-129	Stoller	No Change
4/29/2003	RAS	Large-New	C	0-129	Stoller	No Change
4/30/2003	NMLS	Moisture	1	0-129.25	Stoller	Moisture Baseline
7/23/2003	RAS	Large-New	D	0-129	Stoller	No Change
7/23/2003	NMLS	Moisture	2	0-129.25	Stoller	No Change
9/11/2003	NMLS	Moisture	3	0-129.25	Stoller	No Change
9/17/2003	RAS	Large-New	E	0-129	Stoller	No Change, gain drift
10/23/2003	NMLS	Moisture	4	0-129.25	Stoller	No Change
10/31/2003	RAS	Large-New	F	0-129	Stoller	No Change, gain drift
12/10/2003	NMLS	Moisture	5	0-129.25	Stoller	No Change
12/22/2003	RAS	Large-New	G	0-129	Stoller	No Change
02/25/04	RAS	Large-New	H	0-129	Stoller	No Change
03/01/04	SGLS	G2A	NA	40-100	Stoller	No Change
03/01/04	NMLS	Moisture	6	0-129.25	Stoller	No Change
11/12/2004	NMLS	Moisture	7	0-129.25	Stoller	No Change

Tank C-106

30-06-04





**Hanford Single Shell Tank Farms
Borehole Geophysics Summary Sheet**

Page 1 of 1

Borehole Number (Alias): 30-06-09 (299-E27-85) (A6710)

Borehole Information

Site: C Farm, Tank C-108

Coordinates (HAN Plant):	North: 42932	West: 48302	Elevation (ft): 645.40
Coordinates (WA Plane):	North: 136568.821	East: 575168.813	Elevation (m): 197.979
Drill Date: 7/31/1974	Type: Cable Tool	Depth (ft): 98.5	Depth Datum: TOC
Depth/Water (ft): Dry		D/W Date: 2/19/04	D/W Reference: Stoller
Comments: None.			

Casing Information

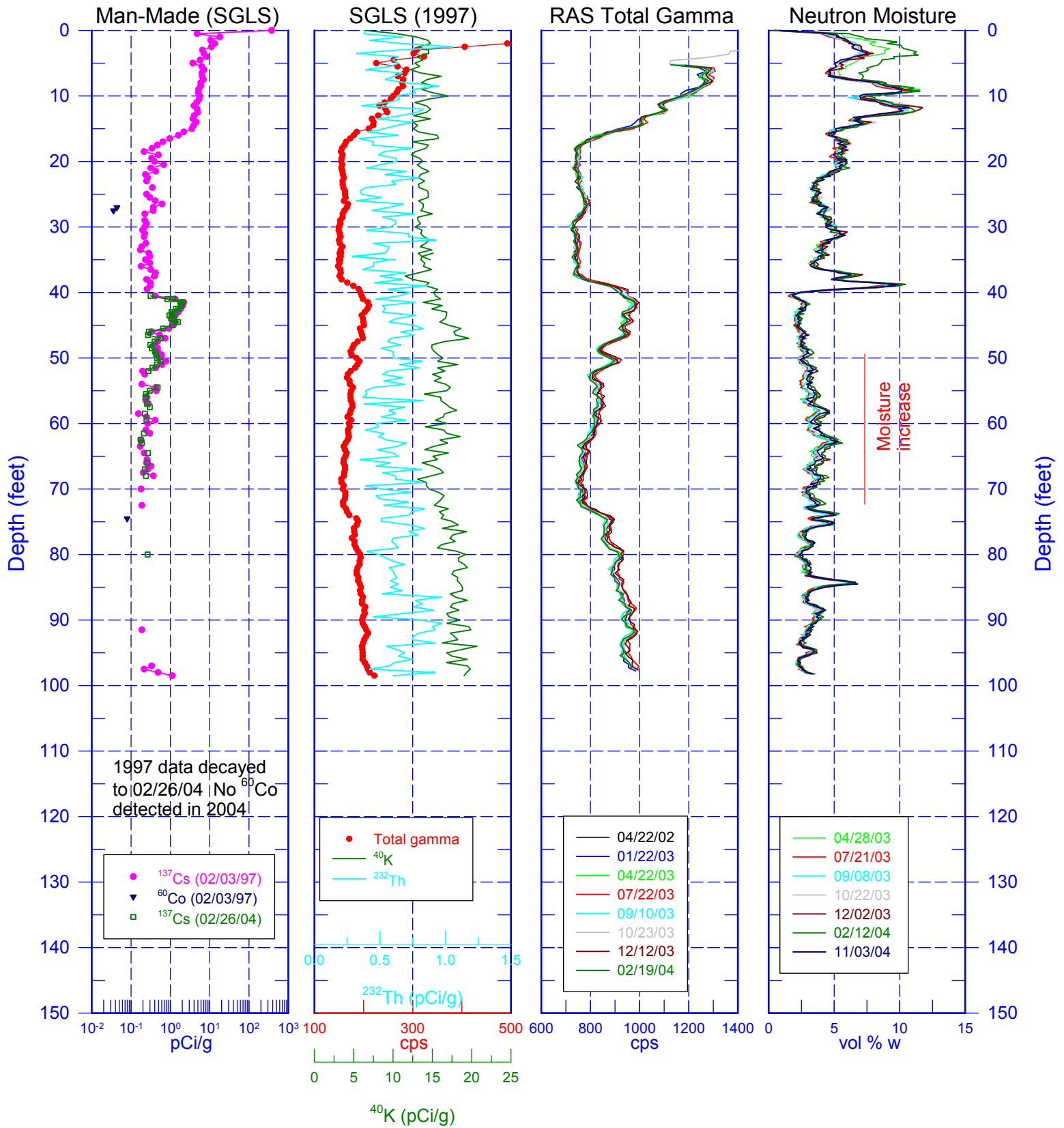
Type	Top(ft)	Bottom (ft)	ID (in)	Thick. (in)	Stickup (ft)	Reference
Steel	0	100	6	0.28	0	Stoller

Log Run Information

Log Date	System	Detector	Event	Log int. (ft)	Contractor	Comments
04/22/93	RLS	Unk	NA	0-95	WHC	C-106 Investigation
2/3/97	SGLS	G1A	NA	0-98.5	MACTEC-ERS	Baseline
4/22/02	RAS	Large	A	25-80	MACTEC-ERS	No Change
1/22/03	RAS	Large-New	B	5-98	Stoller	No Change (gain drift)
4/22/03	RAS	Large-New	C	5-98	Stoller	No Change
7/22/03	RAS	Large-New	D	5-98	Stoller	No Change
4/28/03	NMLS	Moisture	1	0-98.25	Stoller	Moisture Baseline
7/21/03	NMLS	Moisture	2	0-98.25	Stoller	No Change
9/8/03	NMLS	Moisture	3	0-98.25	Stoller	No Change
9/10/03	RAS	Large-New	E	5-98	Stoller	No Change
10/22/03	NMLS	Moisture	4	0-98.25	Stoller	No Change
10/23/03	RAS	Large-New	F	0-98	Stoller	No Change
12/2/03	NMLS	Moisture	5	0-98.25	Stoller	No Change
12/12/03	RAS	Large-New	G	0-98	Stoller	No Change (gain drift)
2/12/04	NMLS	Moisture	6	0-98.25	Stoller	No Change
2/19/04	RAS	Large-New	H	5-98	Stoller	No Change
2/26/04	SGLS	G2A	NA	40-80	Stoller	No change
11/3/04	NMLS	Moisture	7	0-98.25	Stoller	No Change

Tank C-106

30-06-09





**Hanford Single Shell Tank Farms
Borehole Geophysics Summary Sheet**

Page 1 of 1

Borehole Number (Alias): 30-06-10 (299-E27-71) (A6696)

Borehole Information

Site: C Farm, Tank C-106

Coordinates (HAN Plant):	North: 42963	West: 48291	Elevation (ft): 645.31
Coordinates (WA Plane):	North: 136578.287	East: 575172.083	Elevation (m): 197.808
Drill Date: 11/30/1972	Type: Cable Tool	Depth (ft): 129	Depth Datum: TOC
Depth/Water (ft): Dry		D/W Date: 2/17/04	D/W Reference: Stoller
Comments: None.			

Casing Information

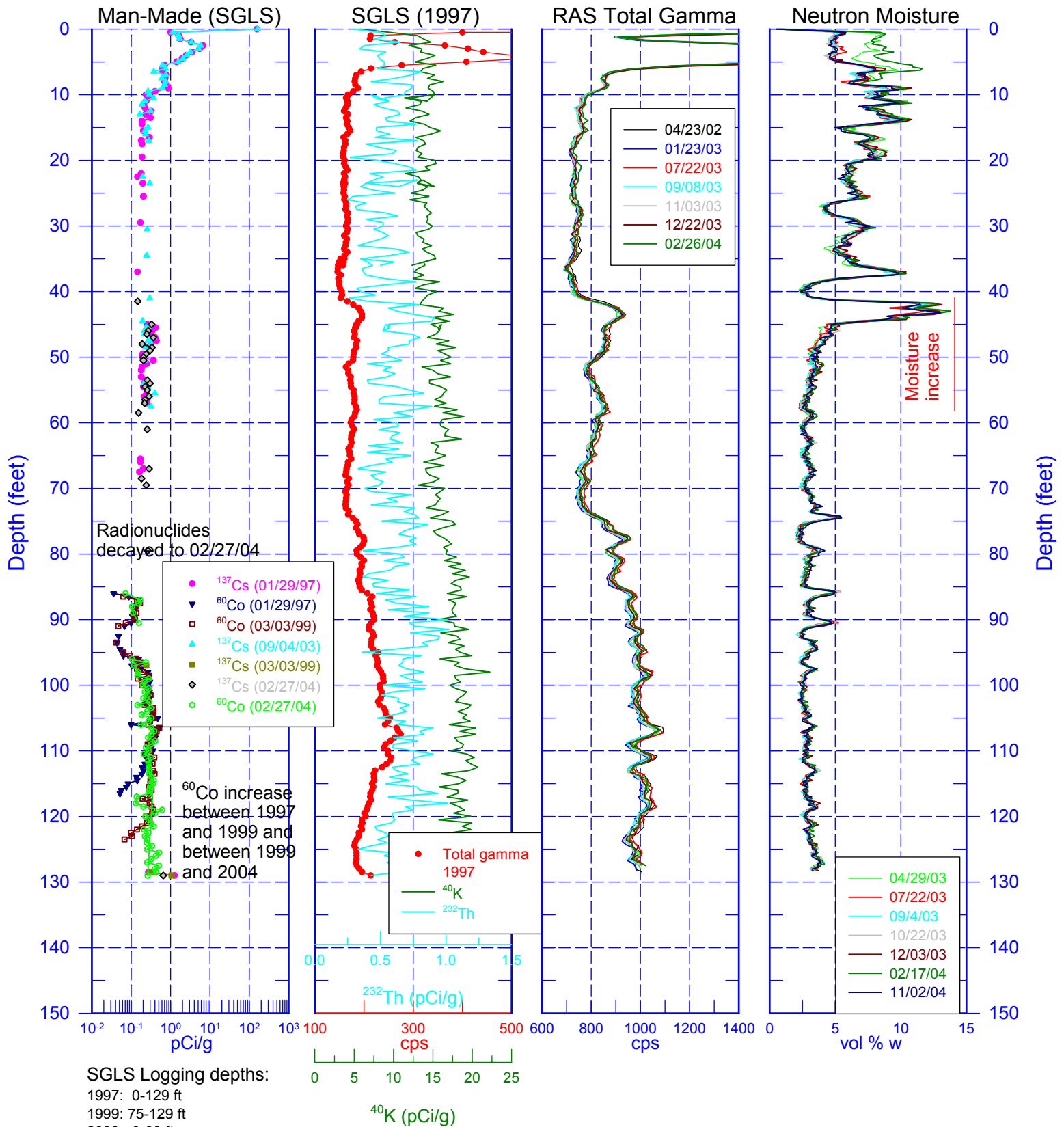
Type	Top(ft)	Bottom (ft)	ID (in)	Thick. (in)	Stickup (ft)	Reference
Steel	0	130	6	0.28	0	Stoller

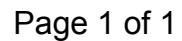
Log Run Information

Log Date	System	Detector	Event	Log int. (ft)	Contractor	Comments
1993	RLS	Unk	NA	0-123	WHC	C-106 Investigation
01/29/97	SGLS	G1A	NA	0-129	MACTEC-ERS	Baseline
03/03/99	SGLS	G2B	NA	75-129	MACTEC-ERS	Continued Movement
04/23/02	RAS	Large	A	30-129	MACTEC-ERS	Poss. Increase 124-126
01/23/03	RAS	Large-New	B	0-129	Stoller	No change from above
04/22/03	RAS	Large-New	C	0-128	Stoller	Poss. Cs increase 4-5 ft
07/22/03	RAS	Large-New	D	0-128	Stoller	No change from above
04/29/03	NMLS	Moisture	1	0-128.25	Stoller	Moisture Baseline
07/22/03	NMLS	Moisture	2	0-128.25	Stoller	No Change
09/04/03	NMLS	Moisture	3	0-128.25	Stoller	No Change
09/04/03	SGLS	G2A	NA	0-60	Stoller	No Change
09/08/03	RAS	Large-New	E	0-128	Stoller	No Change
10/21/03	NMLS	Moisture	4	0-128.25	Stoller	No Change
11/03/03	RAS	Large-New	F	0-128	Stoller	No Change
12/03/03	NMLS	Moisture	5	0-128.25	Stoller	No Change
12/22/03	RAS	Large-New	G	0-128	Stoller	No Change
02/17/04	NMLS	Moisture	6	0-128.25	Stoller	No Change
02/26/04	RAS	Large-New	H	0-128	Stoller	No Change
02/27/04	SGLS	G2A	NA	40-129	Stoller	Cont. move. 124-129
11/02/04	NMLS	Moisture	7	0-128.25	Stoller	No Change

Tank C-106

30-06-10





Borehole Information

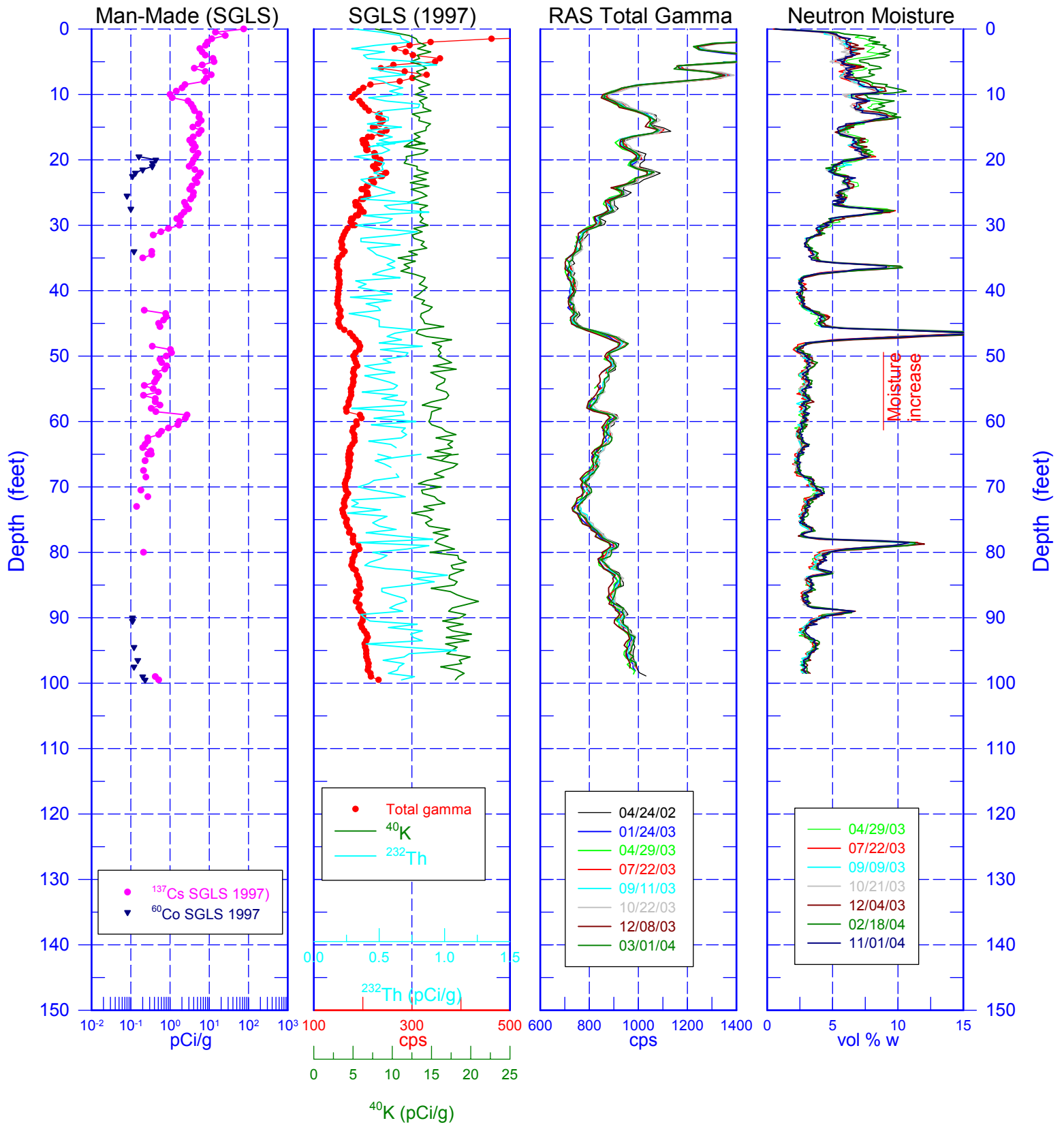
Coordinates (HAN Plant):	North: 42976	West: 48260	Elevation (ft): 644.74
Coordinates (WA Plane):	North: Unk	East: Unk	Elevation (m): Unk
Drill Date: 8/31/1974	Type: Cable Tool	Depth (ft): 98.5	Depth Datum: TOC
Depth/Water (ft): Dry	D/W Date: 2/18/04	D/W Reference: Stoller	
Comments: None.			

Type	Top(ft)	Bottom (ft)	ID (in)	Thick. (in)	Stickup (ft)	Reference
Steel	0	100	6	0.28	0	Stoller

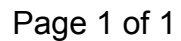
[illegible]

Tank C-106

30-06-12



Appendix D
Tank S-112 Retrieval Monitoring Log Plots



Borehole Information

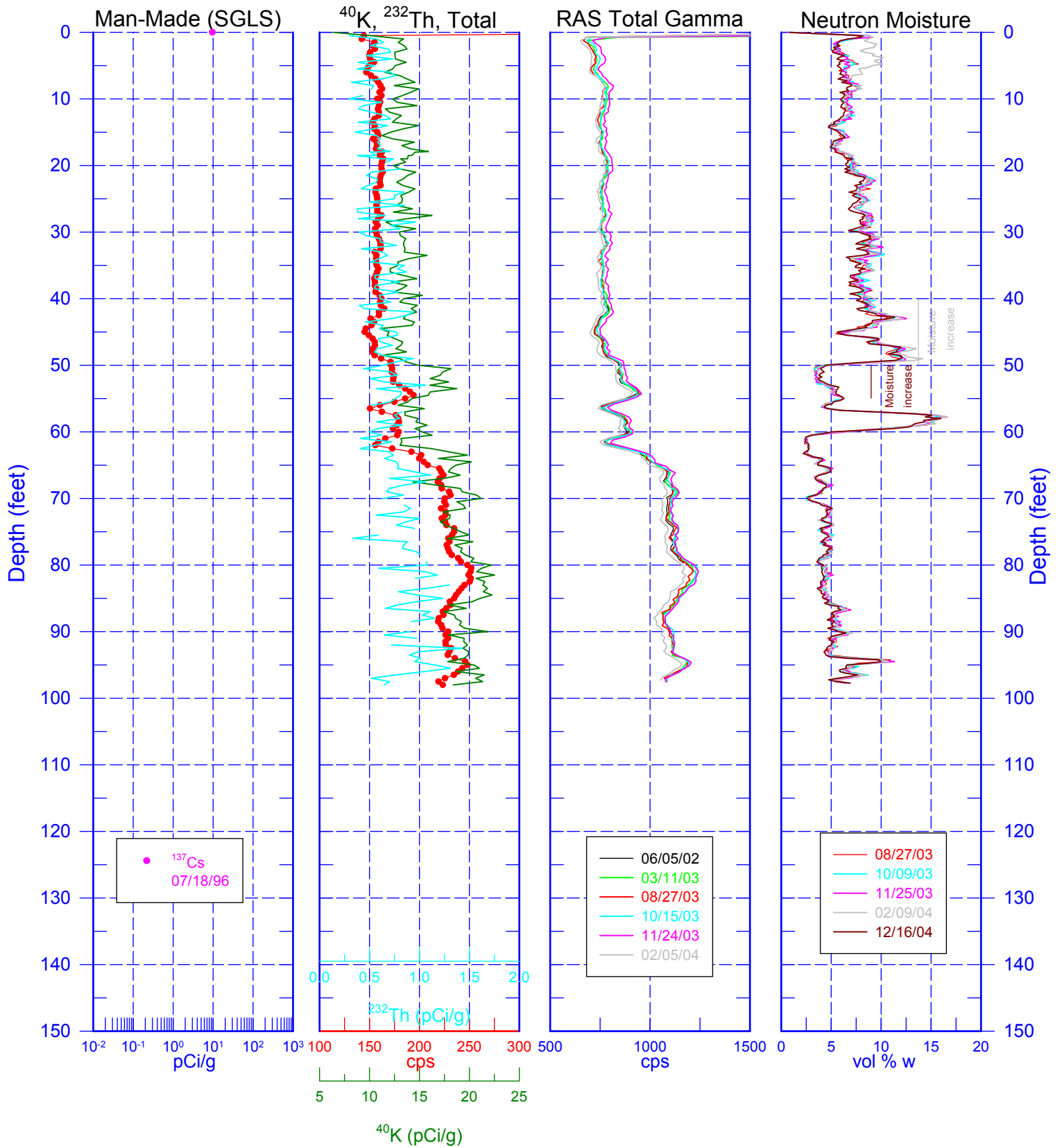
Coordinates (HAN Plant):	North: 35977	West: 75877	Elevation (ft): 663.55
Coordinates (WA Plane):	North: 134426.712	East: 566770.365	Elevation (m): 203.285
Drill Date: 10/31/1971	Type: Cable Tool	Depth (ft): 98	Depth Datum: TOC
Depth/Water (ft): Dry	D/W Date: 2/5/05	D/W Reference: Stoller	
Comments: None.			

Type	Top(ft)	Bottom (ft)	ID (in)	Thick. (in)	Stickup (ft)	Reference
Steel	0	100	6	0.28	0	Stoller

[illegible]

Tank S-109

40-09-06





Borehole Information

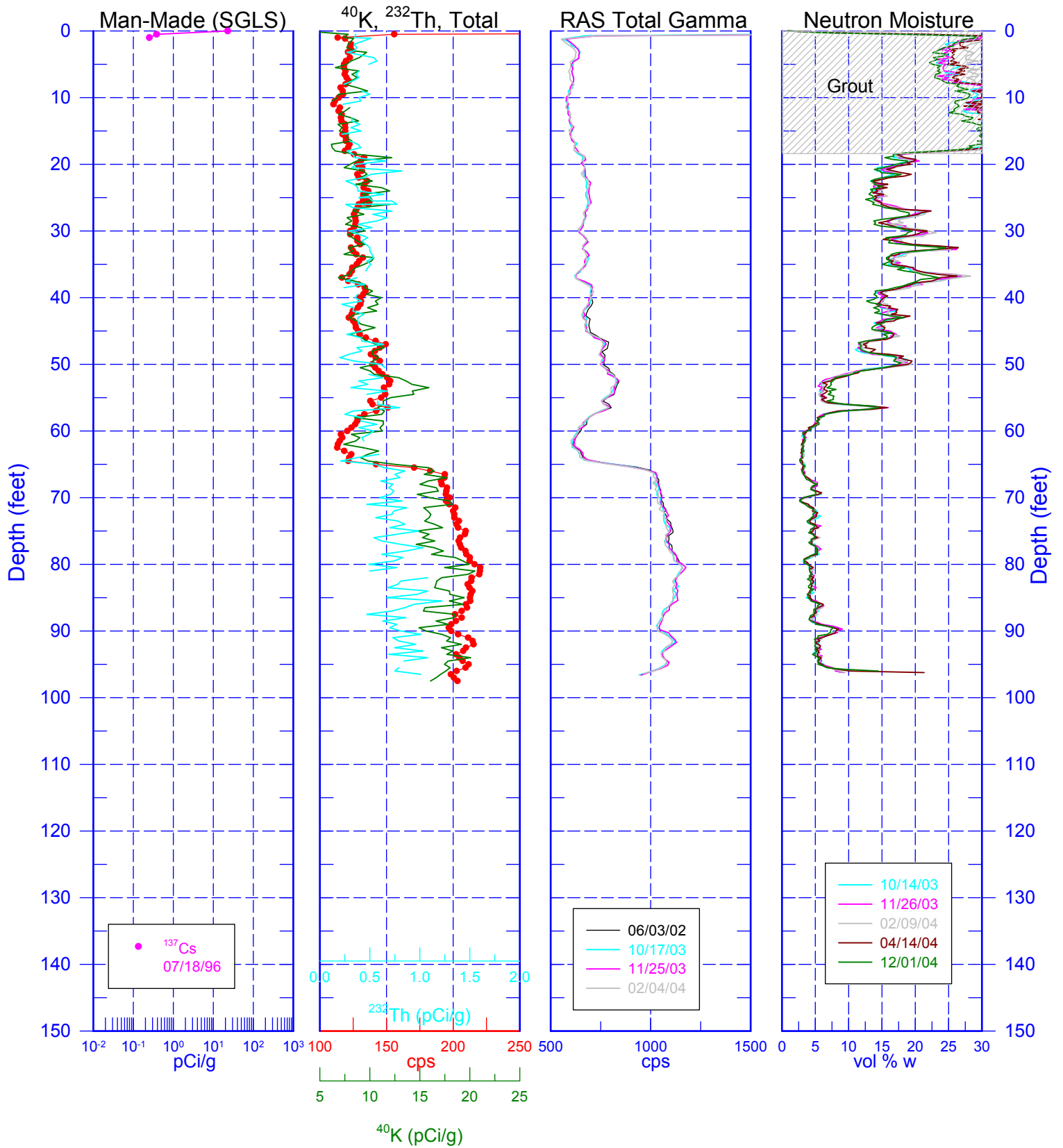
Coordinates (HAN Plant):	North: 35900	West: 75815	Elevation (ft): 663.00
Coordinates (WA Plane):	North: 134403.286	East: 566786.133	Elevation (m): 203.43
Drill Date: 3/31/1976	Type: Cable Tool	Depth (ft): 97.5	Depth Datum: TOC
Depth/Water (ft): 96.75	D/W Date: 2/4/04	D/W Reference: Stoller	
Comments: The upper 20 ft of this borehole are grout and the bottom of the borehole was filled with grout.			

Type	Top(ft)	Bottom (ft)	ID (in)	Thick. (in)	Stickup (ft)	Reference
Steel	0	100	6	0.28	0	Stoller

[illegible]

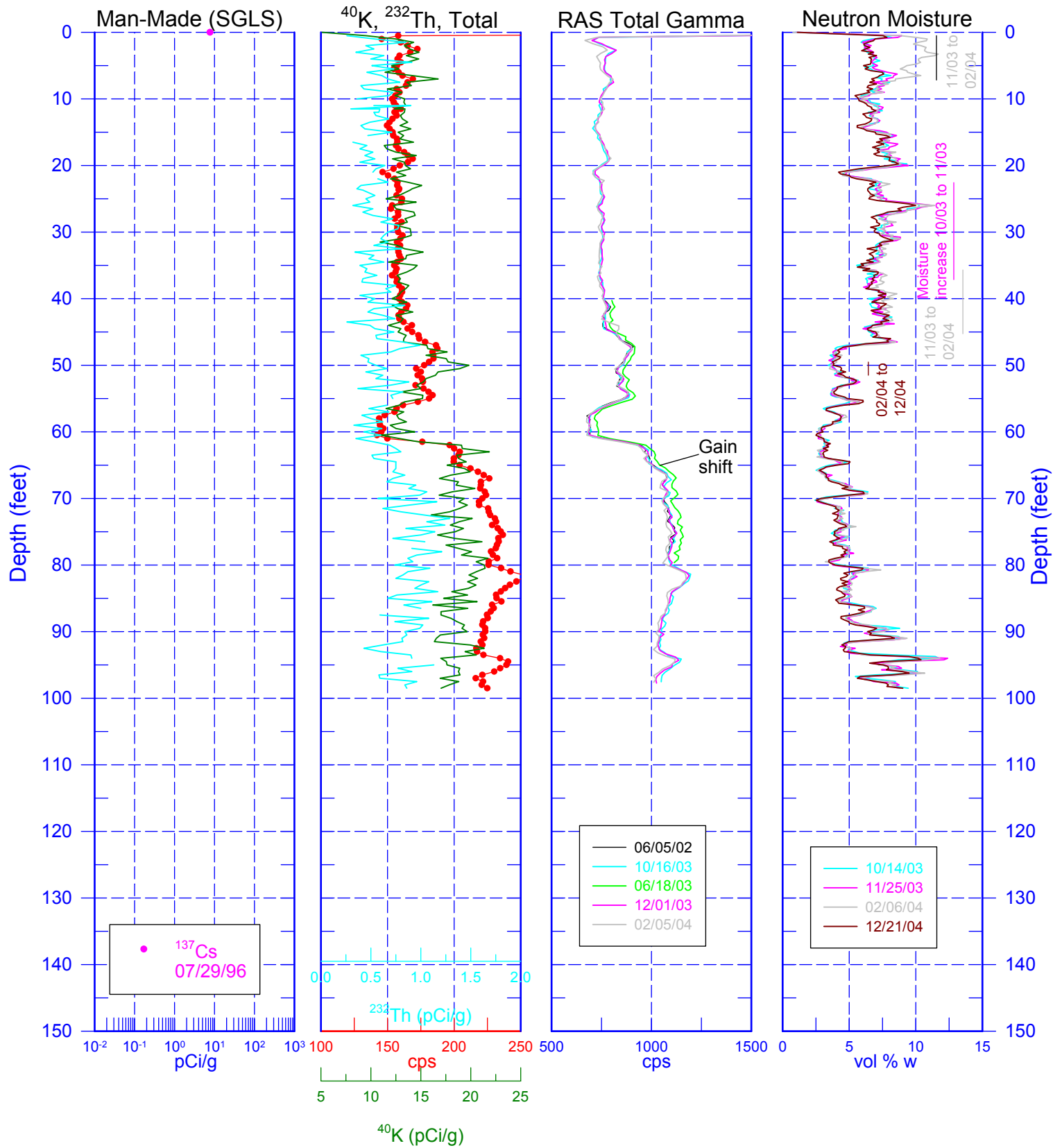
Tank S-111

40-11-08



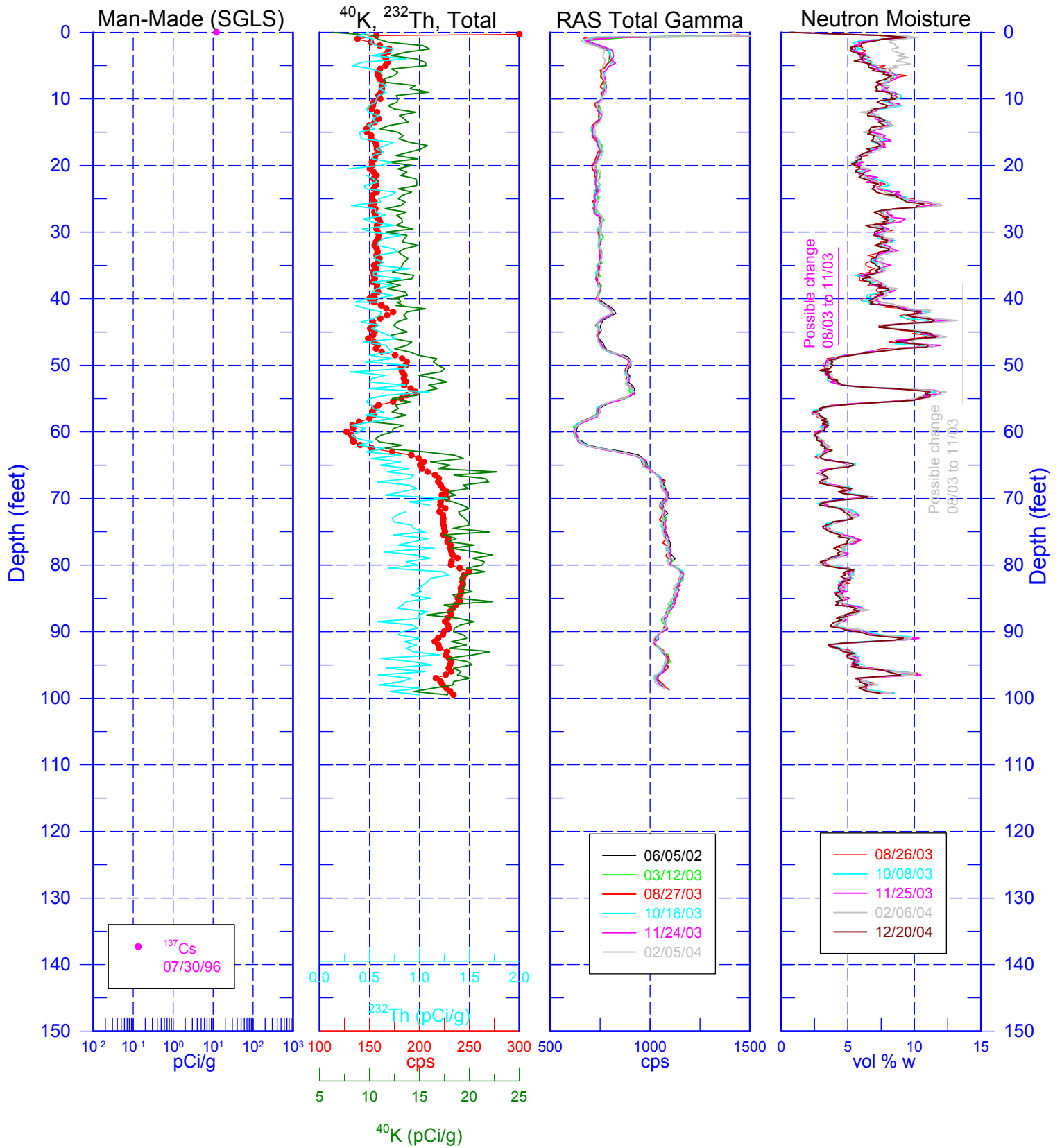
Tank S-111

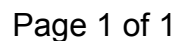
40-11-09



Tank S-112

40-12-02





Borehole Information

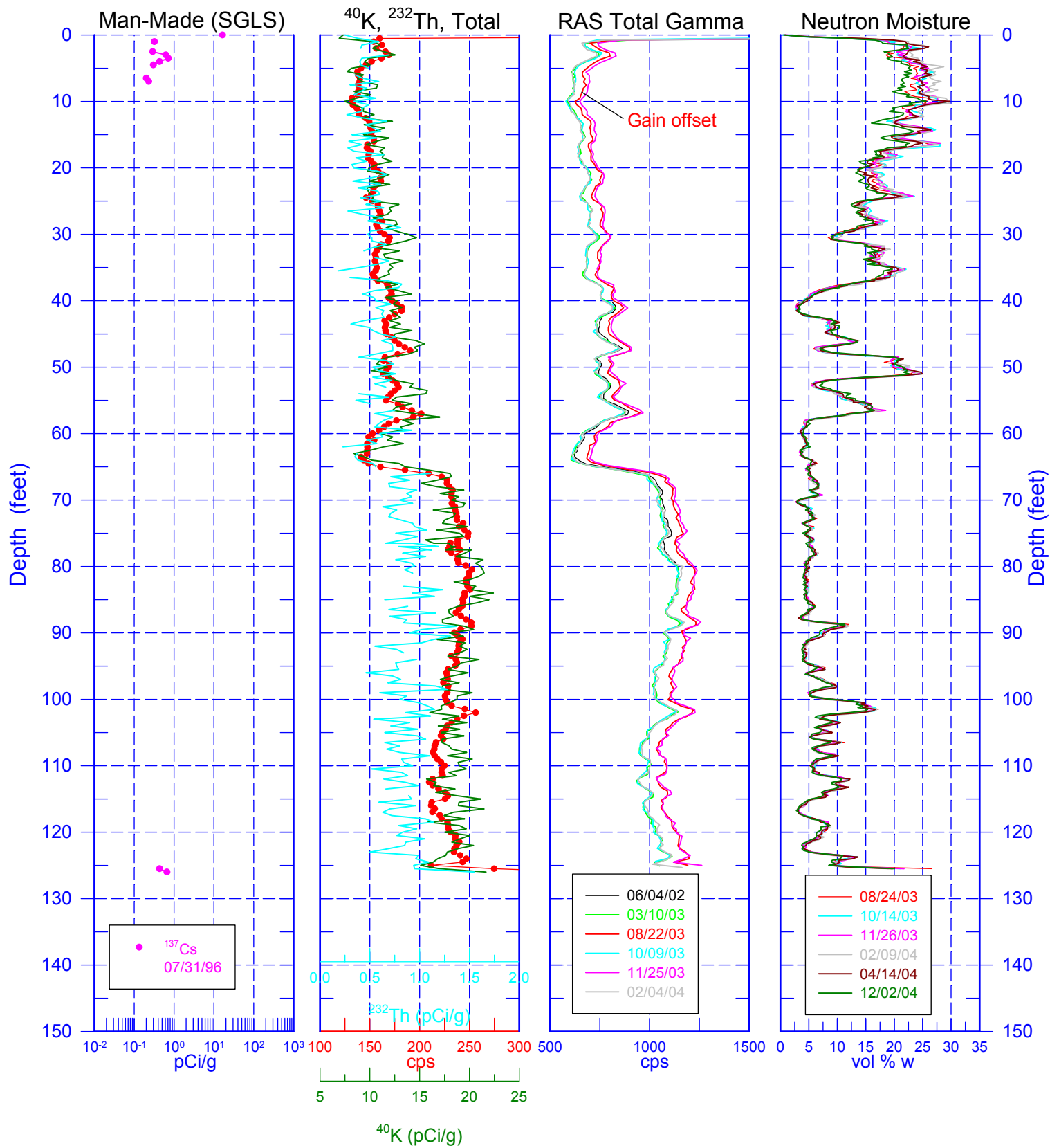
Coordinates (HAN Plant):	North: 35897	West: 75829	Elevation (ft): 663.00
Coordinates (WA Plane):	North: 134401.976	East: 566785.425	Elevation (m): 203.387
Drill Date: 6/30/1978	Type: Cable Tool	Depth (ft): 126	Depth Datum: TOC
Depth/Water (ft): Dry	D/W Date: 2/4/04	D/W Reference: Stoller	
Comments: The top 20 ft of this borehole was grouted. The bottom of this borehole was filled with grout.			

Type	Top(ft)	Bottom (ft)	ID (in)	Thick. (in)	Stickup (ft)	Reference
Steel	0	125	6	0.28	0	Stoller

[illegible]

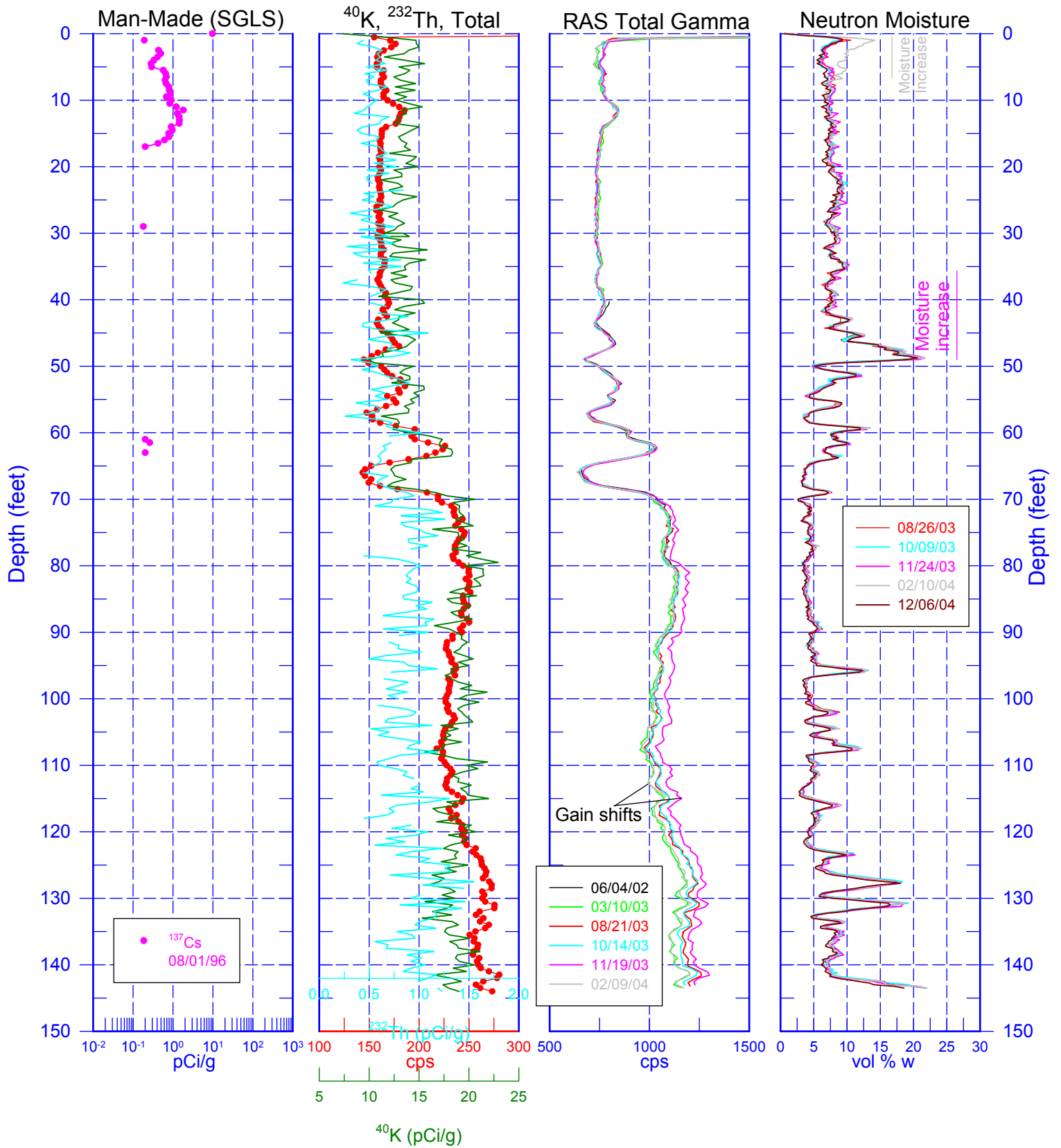
Tank S-112

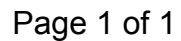
40-12-04



Tank S-112

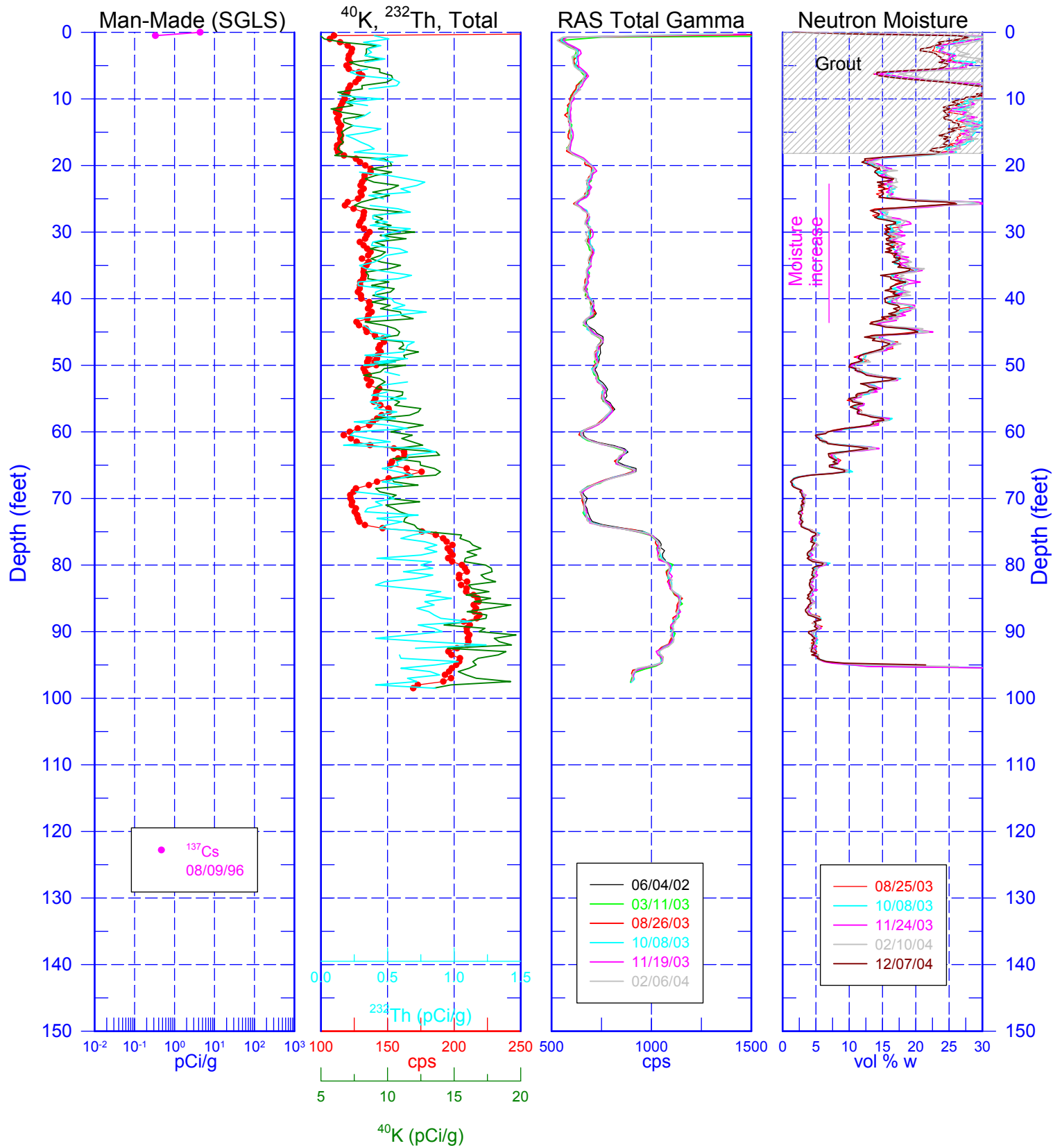
40-12-06

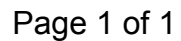


[illegible]

Tank S-112

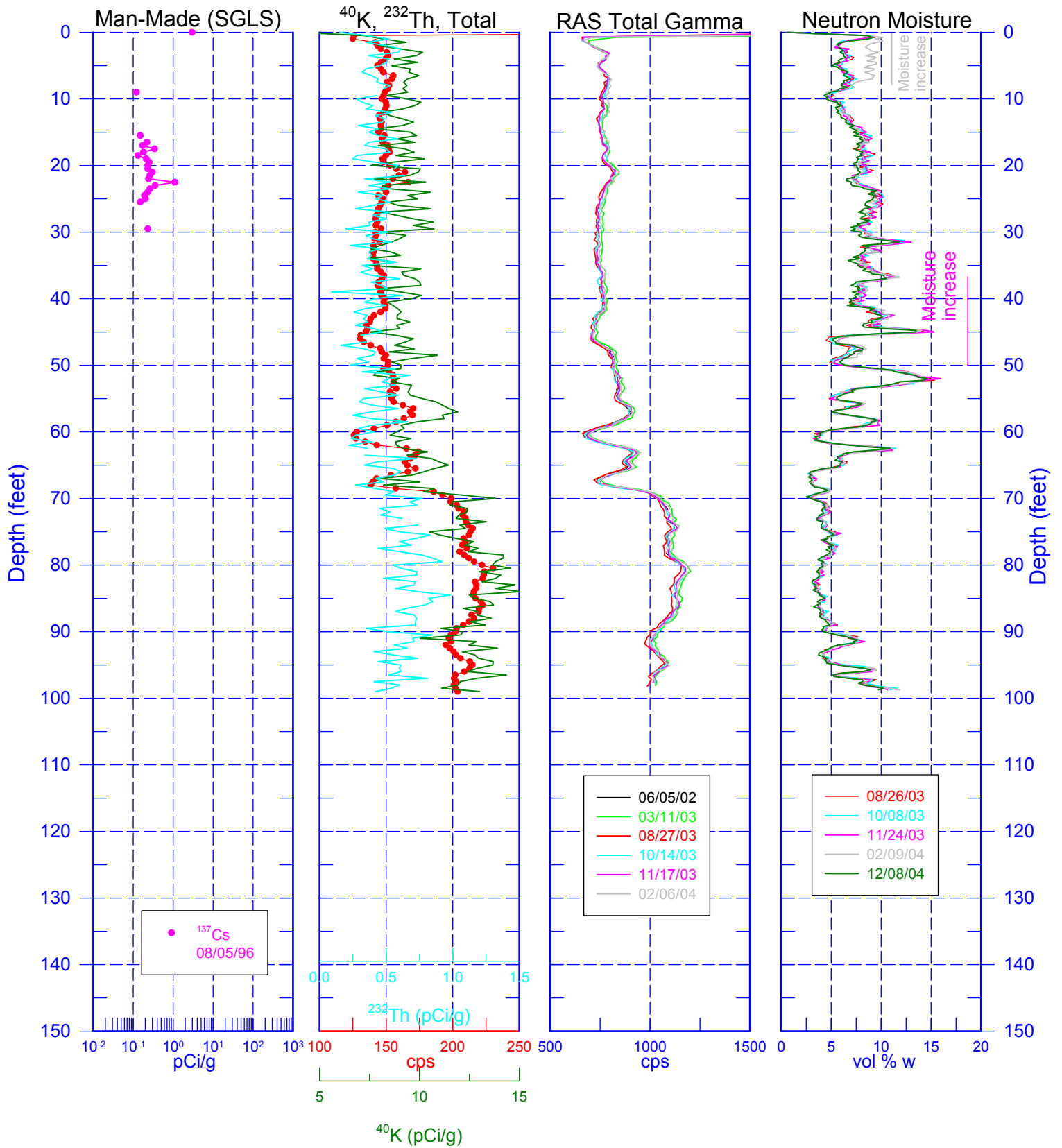
40-12-07



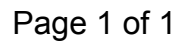
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Tank S-112

40-12-09

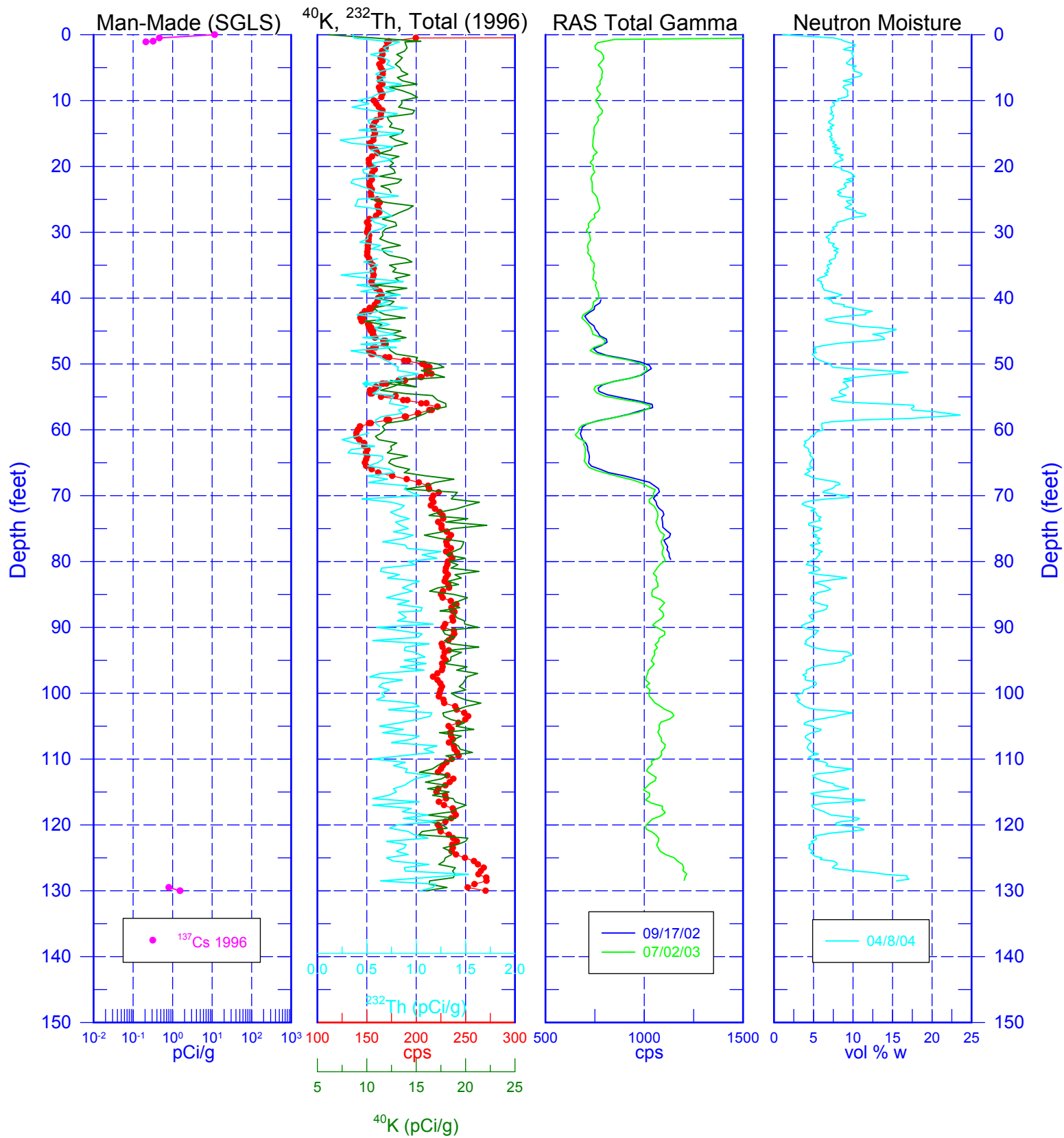


Appendix E
Tank S-102 Retrieval Monitoring Log Plots

[illegible]

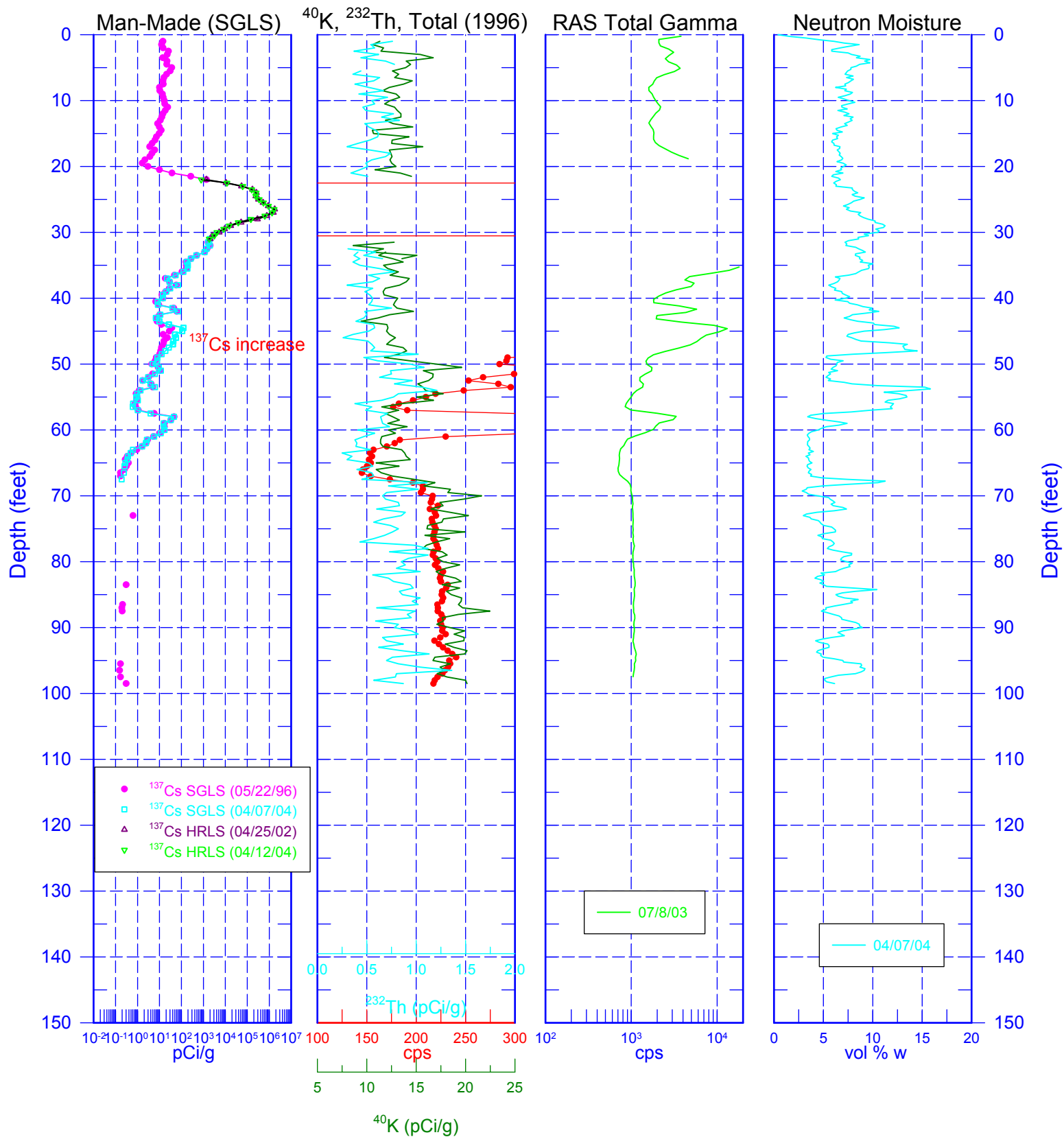
Tank S-102

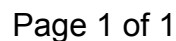
40-02-01



Tank S-102

40-02-03





Borehole Information

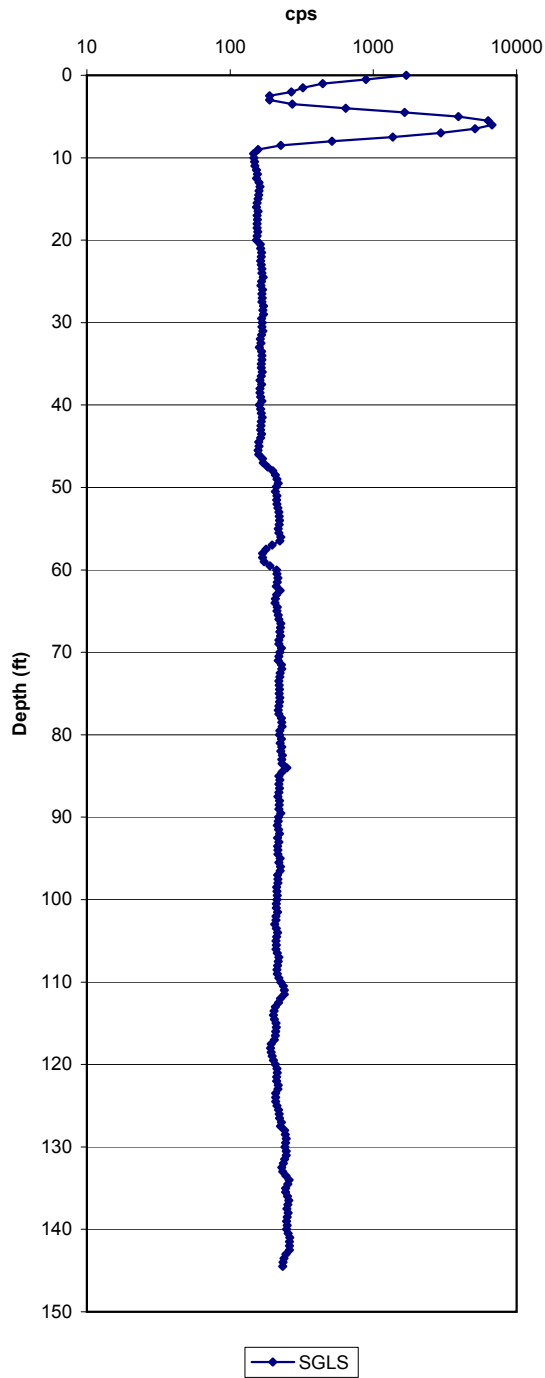
Coordinates (HAN Plant):	North: 36186	West: 75722	Elevation (ft): 663.00
Coordinates (WA Plane):	North: 134509.725	East: 566815.338	Elevation (m): 204.058
Drill Date: 3/13/1952	Type: Cable Tool	Depth (ft): 144.5	Depth Datum: TOC
Depth/Water (ft): Dry	D/W Date: 7/9/03	D/W Reference: Stoller	
Comments: The casing is perforated from 40 to 100 ft.			

Type	Top(ft)	Bottom (ft)	ID (in)	Thick. (in)	Stickup (ft)	Reference
Steel	0	150	5	0.28	0	Stoller

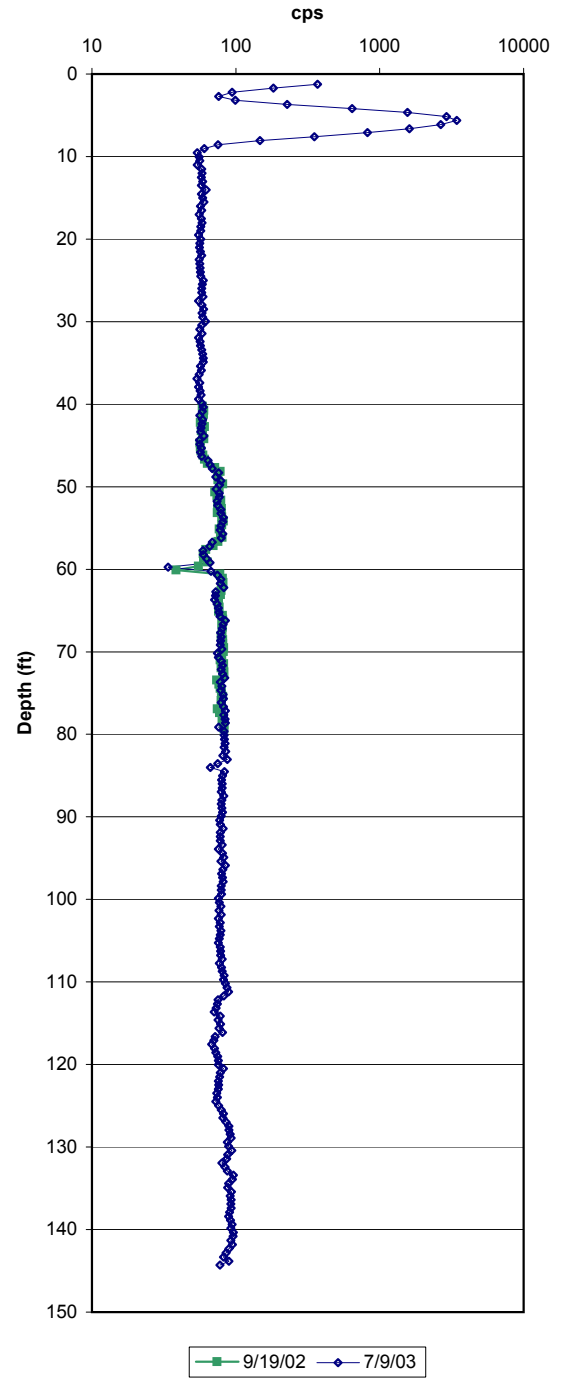
[illegible]

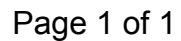
Borehole 40-02-04

SGLS Total Gamma
Log Date: 5/23/96



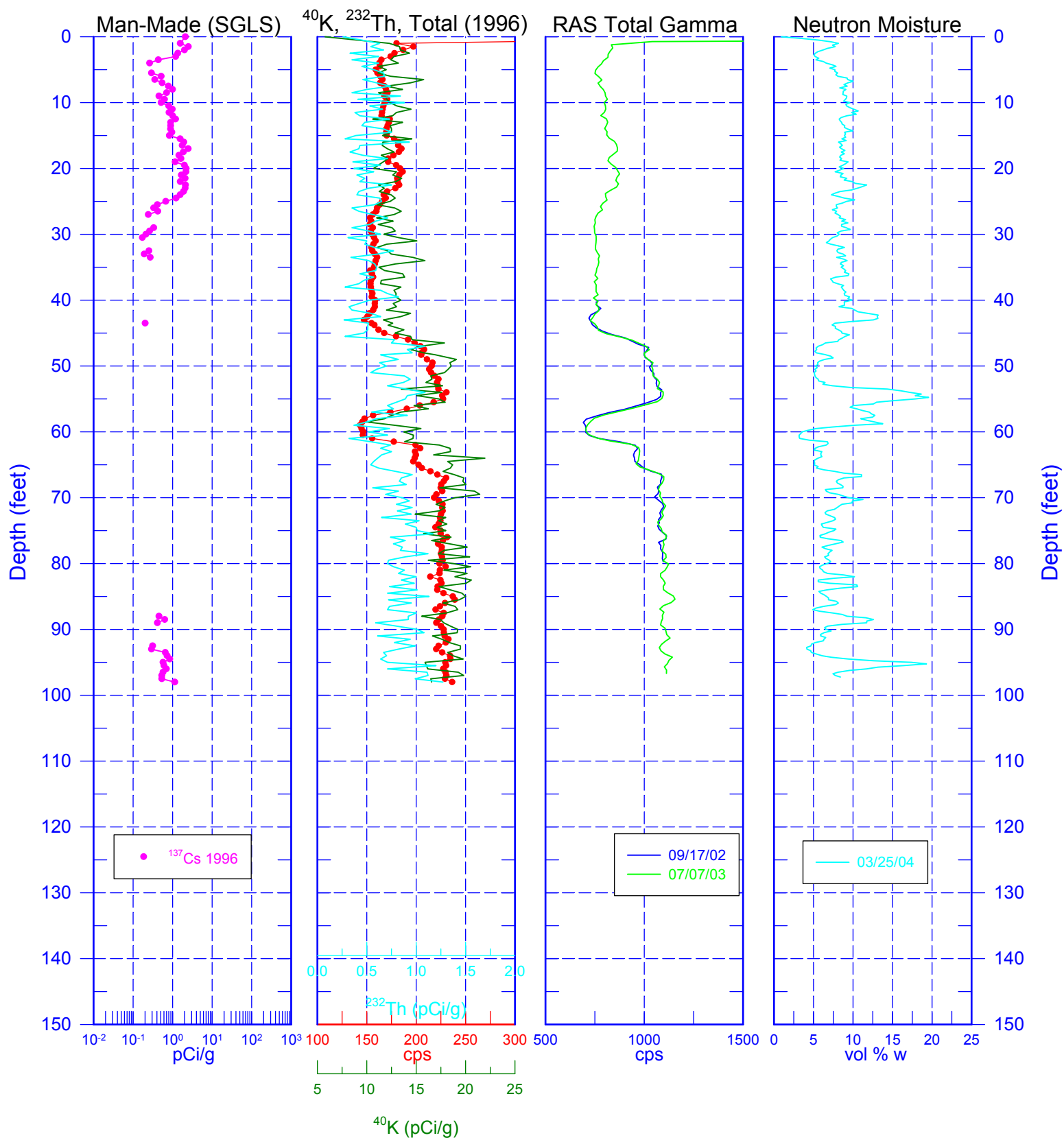
RAS Total Gamma (Medium Detector)
Log Date: See Legend Below

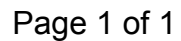


[illegible]

Tank S-102

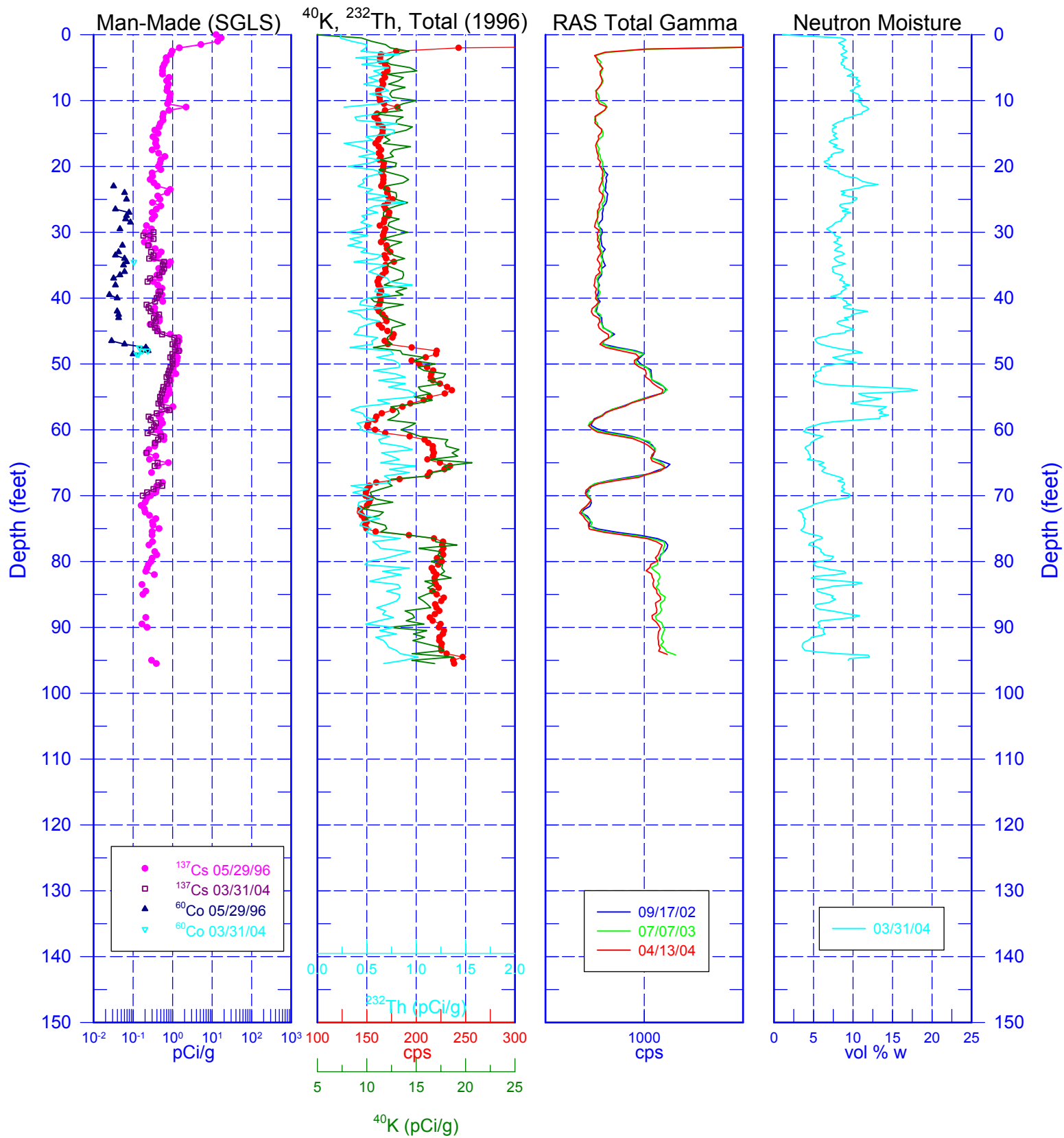
40-02-05

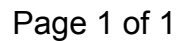


[illegible]

Tank S-102

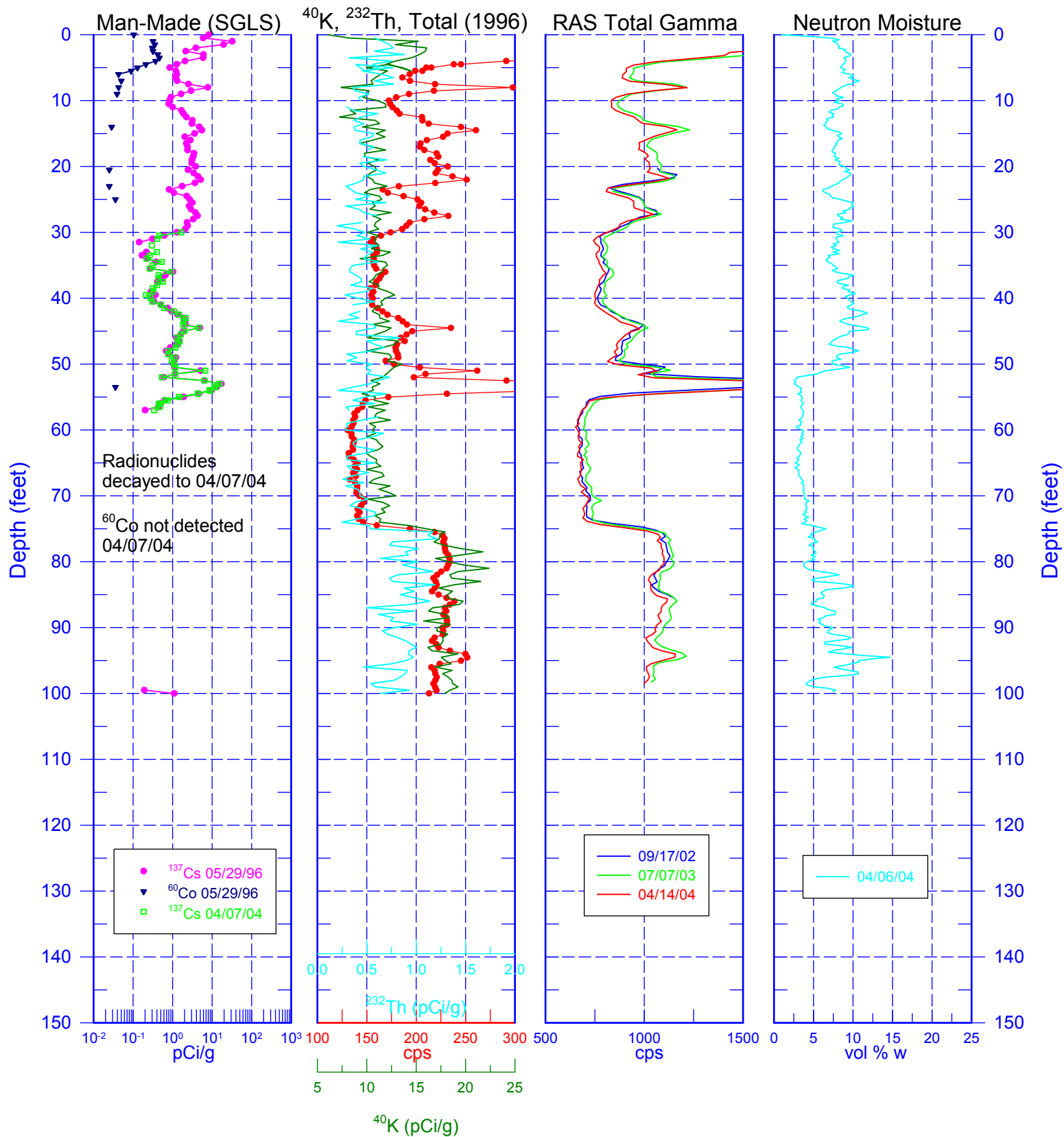
40-02-07



[illegible]

Tank S-102

40-02-08





Borehole Information

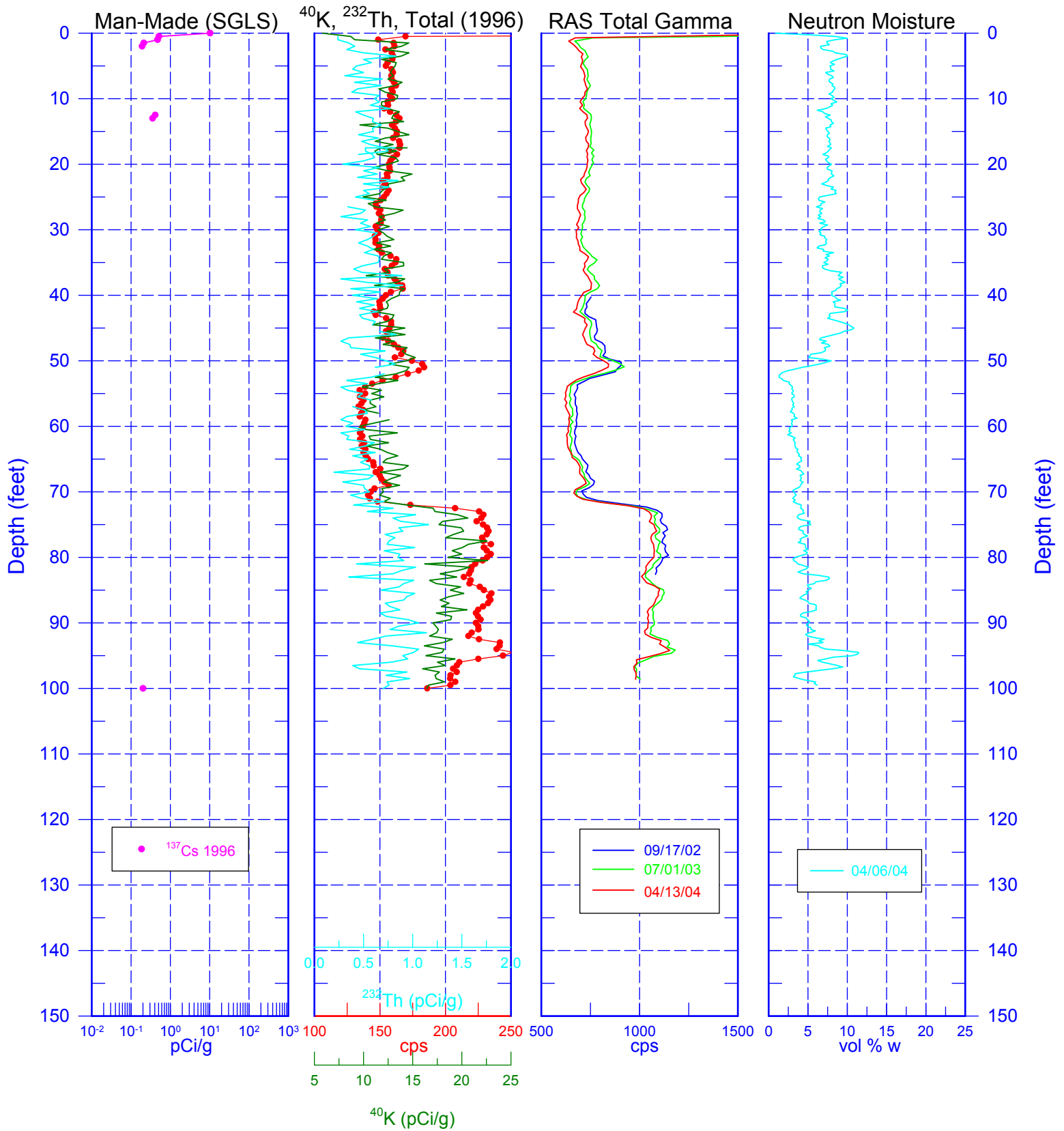
Coordinates (HAN Plant):	North: 36242	West: 75810	Elevation (ft): 663.68
Coordinates (WA Plane):	North: 134507.539	East: 566790.522	Elevation (m): 203.327
Drill Date: 10/31/1971	Type: Cable Tool	Depth (ft): 100	Depth Datum: TOC
Depth/Water (ft): Dry		D/W Date: 4/6/04	D/W Reference: Stoller
Comments: None.			

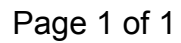
Type	Top(ft)	Bottom (ft)	ID (in)	Thick. (in)	Stickup (ft)	Reference
Steel	0	100	6	0.28	0	Stoller

[illegible]

Tank S-102

40-02-10





Borehole Information

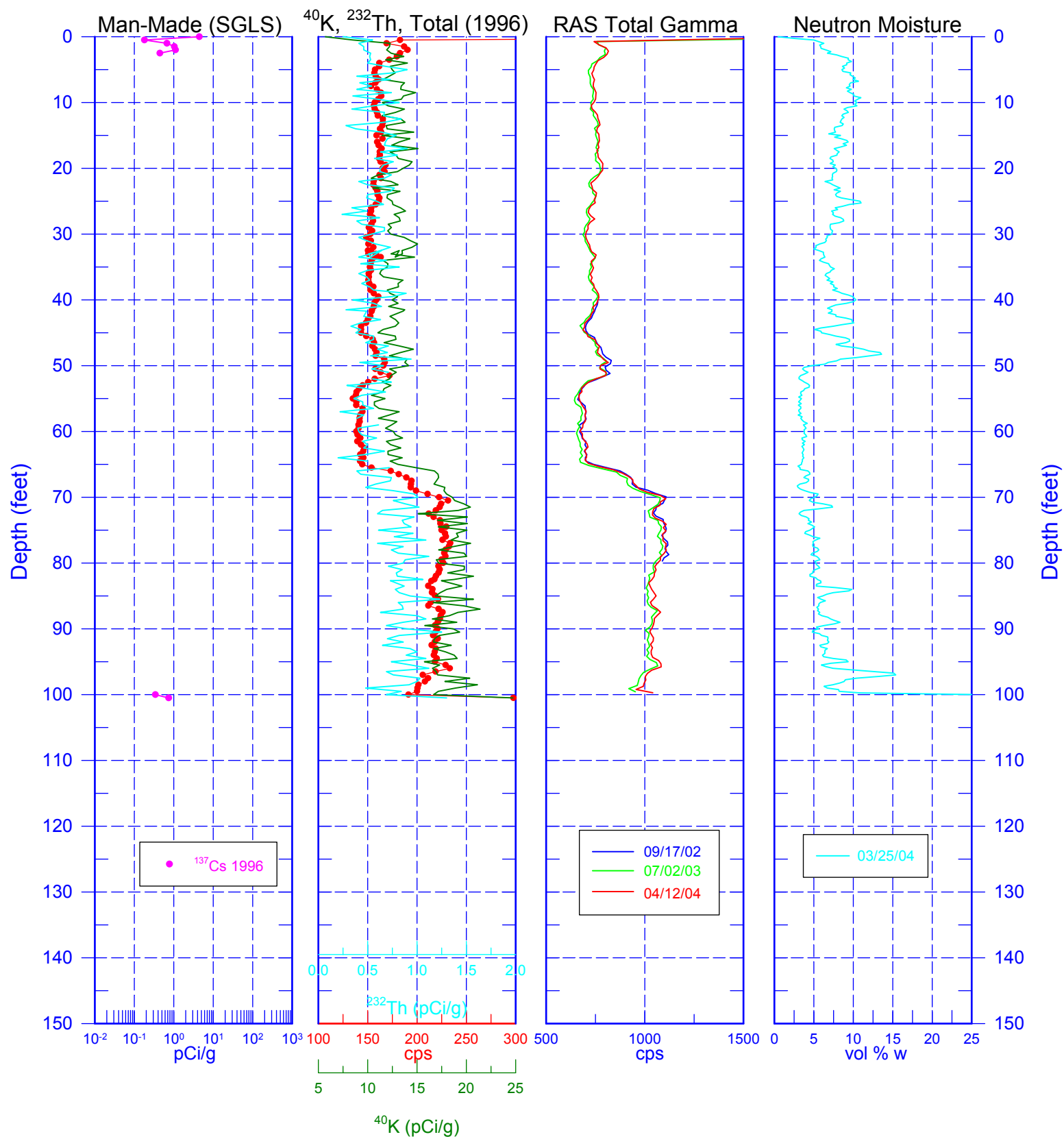
Coordinates (HAN Plant):	North: 36271	West: 75786	Elevation (ft): 665.24
Coordinates (WA Plane):	North: 134516.321	East: 566797.76	Elevation (m): 203.798
Drill Date: 3/31/1974	Type: Cable Tool	Depth (ft): 100.5	Depth Datum: TOC
Depth/Water (ft): Dry	D/W Date: 3/25/04	D/W Reference: Stoller	
Comments: None.			

Type	Top(ft)	Bottom (ft)	ID (in)	Thick. (in)	Stickup (ft)	Reference
Steel	0	100	6	0.28	0	Stoller

[illegible]

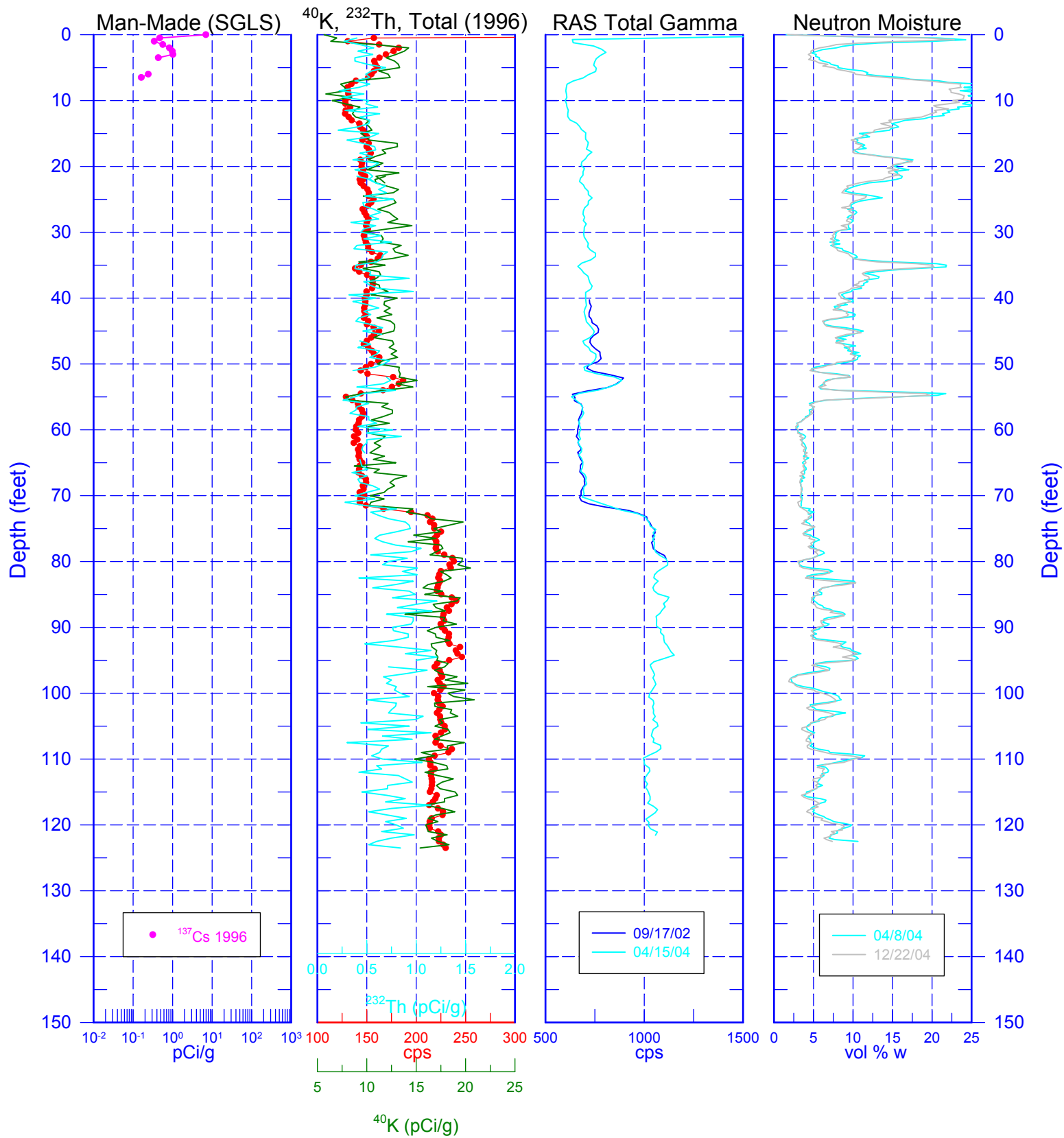
Tank S-102

40-02-11



Tank S-102

40-03-03



Appendix F
Boreholes Projected for Retrieval Monitoring
During the Second Quarter of FY 2005

Table F-1. Boreholes Projected for Retrieval Monitoring During the 2nd Quarter of FY 2005

Borehole Number	Tank	Top	Bottom	Footage	Next Log Date	Last Event Date	Projected 2nd Qtr. Event	Total Events (to date)	Comment
11-03-02	AX-103	20	90	70	06/05/04	06/11/03	1	2	AX-103 Leak Assessment
11-01-09	AX-101	30	85	55	09/21/03	09/26/02	1	1	AX-103 Leak Assessment
11-03-05	AX-103	35	85	50	08/18/01	09/13/96	1	0	AX-103 Leak Assessment
11-03-07	AX-103	30	85	55	08/22/01	09/17/96	1	0	AX-103 Leak Assessment
11-03-09	AX-103	30	85	55	05/15/08	06/11/03	1	1	AX-103 Leak Assessment
11-03-10	AX-103	30	85	55	08/22/01	09/17/96	1	0	AX-103 Leak Assessment
11-03-12	AX-103	30	85	55	08/17/01	09/12/96	1	0	AX-103 Leak Assessment
30-00-01	C-106	0	65	65	03/31/04	03/01/04	1	8	No apparent change, C-106 Retrieval
30-03-01	C-103	0	124	124	05/17/97	04/17/97	1	0	Cannot log because of stairwell; C-103 Retrieval
30-03-03	C-103	0	97	97	05/11/97	04/11/97	1	0	Water in borehole 10/01, C-103 Retrieval
30-03-05	C-103	0	99	99	10/11/02	09/11/02	1	1	No apparent change, C-103 Retrieval
30-03-07	C-103	0	96	96	10/11/02	09/11/02	1	1	No apparent change, C-103 Retrieval
30-03-09	C-103	0	98	98	06/05/03	05/06/03	1	2	No apparent change, C-103 Retrieval
30-05-02	C-105	5	127	122	03/20/04	02/19/04	1	8	No apparent change, C-106 Retrieval
30-06-02	C-106	0	122	122	03/24/04	02/23/04	1	7	No apparent change, C-106 Retrieval
30-06-03	C-106	0	98	98	03/24/04	02/23/04	1	7	No apparent change, C-106 Retrieval
30-06-04	C-106	0	129	129	03/26/04	02/25/04	1	8	No apparent change, C-106 Retrieval
30-06-09	C-106	5	98	93	03/20/04	02/19/04	1	8	No apparent change, C-106 Retrieval
30-06-10	C-106	0	128	128	03/27/04	02/26/04	1	8	Possible change 124-126 ft Co-60, C-106 Retrieval
30-06-12	C-106	0	98	98	03/31/04	03/01/04	1	8	No apparent change, C-106 Retrieval
30-08-02	C-108	30	99	69	03/18/04	02/17/04	1	8	Def change in Co-60 49-75 ft, down move, C-106 Retrieval
30-09-06	C-109	30	98	68	03/21/04	02/20/04	1	7	No apparent change, C-106 Retrieval
30-09-07	C-109	30	121	91	03/18/04	02/17/04	1	7	No apparent change, C-106 Retrieval
40-02-01	S-102	0	129	129	08/01/03	07/02/03	2	2	No apparent change, S-102 Retrieval
40-02-03	S-102	0	98	98	08/07/03	07/08/03	2	1	Apparent Cs-137 increase at 44-47 ft., S-102 Retrieval
40-02-04	S-102	0	144	144	08/08/03	07/09/03	2	2	No apparent change, S-102 Retrieval
40-02-05	S-102	0	97	97	08/06/03	07/07/03	2	2	No apparent change, S-102 Retrieval
40-02-07	S-102	0	95	95	05/13/04	04/13/04	2	3	No apparent change, S-102 Retrieval
40-02-08	S-102	0	99	99	05/14/04	04/14/04	2	3	No apparent change, S-102 Retrieval
40-02-10	S-102	0	100	100	05/13/04	04/13/04	2	3	No apparent change, S-102 Retrieval
40-02-11	S-102	0	100	100	05/12/04	04/12/04	2	3	No apparent change, S-102 Retrieval
40-03-03	S-103	0	122	122	05/15/04	04/15/04	2	2	No apparent change, S-102 Retrieval
40-09-06	S-109	0	98	98	03/06/04	02/05/04	2	6	No apparent change; S-112 Retrieval
40-11-08	S-111	0	97	97	03/05/04	02/04/04	2	4	No apparent change, S-112 Retrieval
40-11-09	S-111	0	98	98	03/06/04	02/05/04	2	5	No apparent change, S-112 Retrieval
40-12-02	S-112	0	99	99	03/06/04	02/05/04	2	6	No apparent change; S-112 Retrieval
40-12-04	S-112	0	126	126	03/05/04	02/04/04	2	6	No apparent change; S-112 Retrieval
40-12-06	S-112	0	144	144	03/10/04	02/09/04	2	6	No apparent change; S-112 Retrieval
40-12-07	S-112	0	98	98	03/07/04	02/06/04	2	6	No apparent change; S-112 Retrieval
40-12-09	S-112	0	98	98	03/07/04	02/06/04	2	6	No apparent change; S-112 Retrieval
			Total Projected 2nd Quarter Events =				57		

Table F-2. Boreholes Projected for Retrieval Moisture Logging During the 2nd Quarter of FY 2005

Borehole Number	Tank	Top	Bottom	Footage	Next Event Date	Last Event Date	Projected 2nd Qtr. Events	Total Events (to date)	Comment
30-03-01	C-103	0	124	124	TBD	NA	1	0	No moisture logging performed to date.
30-03-03	C-103	0	97	97	TBD	NA	1	0	No moisture logging performed to date.
30-03-05	C-103	0	99	99	TBD	NA	1	0	No moisture logging performed to date.
30-03-07	C-103	0	96	96	TBD	NA	1	0	No moisture logging performed to date.
30-03-09	C-103	0	98	98	TBD	NA	1	0	No moisture logging performed to date.
30-06-04	C-106	0	129	129	12/12/04	11/12/04	1	7	Possible moisture increase 45-53 ft
40-02-01	S-102	0	129	129	05/08/04	04/08/04	2	1	Only one log, No comparison
40-02-03	S-102	0	98	98	05/07/04	04/07/04	2	1	Only one log, No comparison
40-02-05	S-102	0	97	97	04/24/04	03/25/04	2	1	Only one log, No comparison
40-02-07	S-102	0	95	95	04/30/04	03/31/04	2	1	Only one log, No comparison
40-02-08	S-102	0	99	99	05/06/04	04/06/04	2	1	Only one log, No comparison
40-02-10	S-102	0	100	100	05/06/04	04/06/04	2	1	Only one log, No comparison
40-02-11	S-102	0	100	100	04/24/04	03/25/04	2	1	Only one log, No comparison
40-03-03	S-103	0	122	122	01/21/05	12/22/04	1	2	None
40-09-06	S-109	0	98	98	01/15/05	12/16/04	1	5	Possible moisture increase 40-56 ft
40-11-08	S-111	0	96	96	12/31/04	12/01/04	1	5	None
40-11-09	S-111	0	98	98	01/20/05	12/21/04	1	4	Poss. moist. increase 23-45 & 49-51 ft
40-12-02	S-112	0	99	99	01/19/05	12/20/04	1	5	Possible moisture increase 32-55 ft
40-12-04	S-112	0	126	126	01/01/05	12/02/04	1	6	Possible moisture increase 53-55 ft
40-12-06	S-112	0	144	144	01/05/05	12/06/04	1	5	Possible moisture increase 36-49 ft
40-12-07	S-112	0	96	96	01/06/05	12/07/04	1	5	Possible moisture increase 23-43 ft
40-12-09	S-112	0	99	99	01/07/05	12/08/04	1	5	Possible moisture increase 36-50 ft
			Total Projected 2nd Quarter Events =				29		